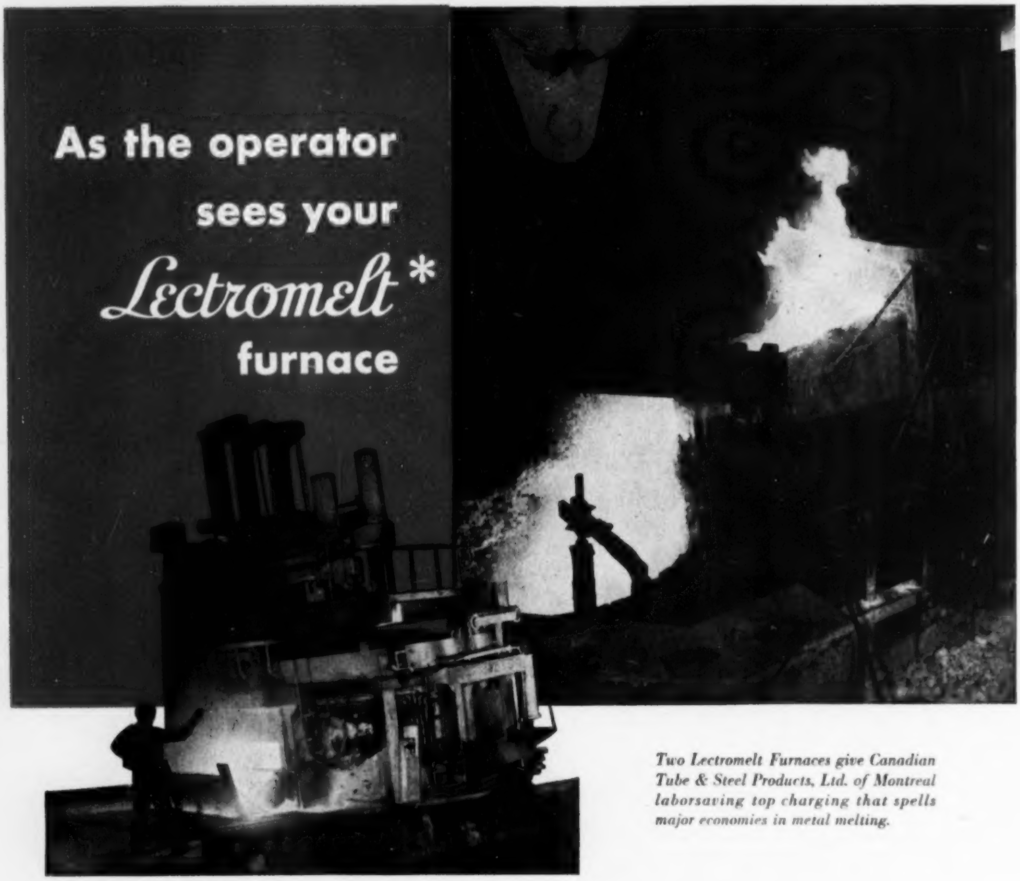
American Foundryman

june 1952

THE FOUNDRYMEN'S OWN MAGAZINE



Two Lectromelt Furnaces give Canadian Tube & Steel Products, Ltd. of Montreal laborsaving top charging that spells major economies in metal melting.

He feels an instant response to every demand:
Power supply and regulation equipment were individually engineered, electrode arms counterbalanced, to provide such sensitive and flexible controls.

He gets back into production promptly after every heat:
Top charging with the Moore Rapid Lectromelt Furnace is accomplished quickly and smoothly, as the furnace top lifts and swings on its massive oil bearings. It means many man-hours saved, lower consumption of electrodes and longer lining life. You see the difference in power saved.

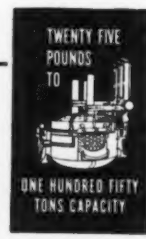
He recognizes its added safety:
Side-mounted tilt mechanism prevents jamming and injury of operating equipment by spills and burn throughs.

All these add up to higher quality production, with more tons for fewer dollars. For a free copy of Catalog No. 8 telling you more of this story, write Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . AUSTRALIA: Birlec, Ltd., Sydney . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID Lectromelt



American Foundryman

June 1952 / *Volume 21 • Number 6*

Official Publication of the American Foundrymen's Society

Melter poling cold-melt air furnace heat at Frazer & Jones Div., Eastern Malleable Iron Co., Syracuse, N. Y. Moisture in the green sapling creates a boil, bringing colder metal to the surface in contact with full heat of the flame. Clusters of unmelted metal are broken up and the slag is worked back to the skimming door. After additions of alloys or carbon, the boiling and rabbling hastens their absorption. Slagging trough in right foreground utilizes jet of water to break up and carry away slag.

Trends

Operations and Methods

Technology

In the news

People

Departments

Published monthly by the American Foundrymen's Society, Inc., 616 S. Michigan Ave., Chicago 5. Subscription price in the U.S., Canada and Mexico $3.00 per year; elsewhere, $6.00. Single copies 50c. Entered as Second Class Matter, July 22, 1938, under Act of March 3, 1879, at the Post Office, Chicago.

TASIL gives you more heats per day more tons per lining

FOR EXAMPLE:

The modern, streamlined foundry of the H. B. Salter Mfg. Co., Marysville, Ohio, operates this battery of 350 lb. Type "LFC" Detroit Electric Furnaces which are maintained with Taylor Sillimanite (TASIL) Linings, Patches and Cements.

These furnaces melt plumbing brass and average 12 to 15 heats of 440 lbs. each in 9 hours. Lining life averages between 750,000 to 1,000,000 lbs. of metal, with minimum patching. Are your furnace linings producing results like this?

OUTER LININGS

TASIL Hydrocast, the castable refractory for use at temperatures up to 3000° F., is now being used to form outer linings for 350 lb. "LFC," 500 lb. "LFN," and 700 lb. "LFY" Detroit Electric Furnaces, replacing insulating fire brick shapes. Experience to date shows Hydrocast to be more economical; easier and faster to install. Your Taylor representative will give you complete details.

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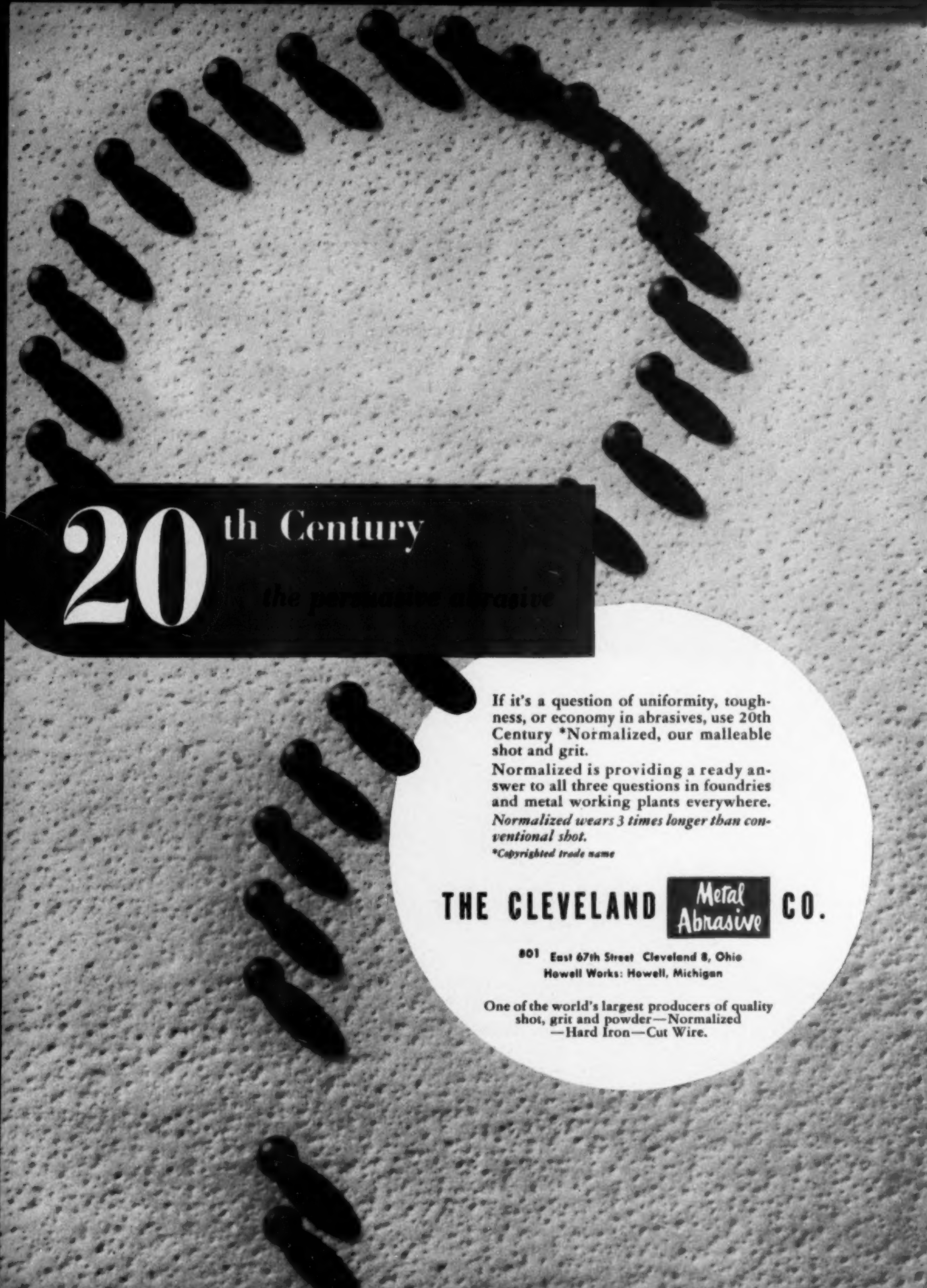
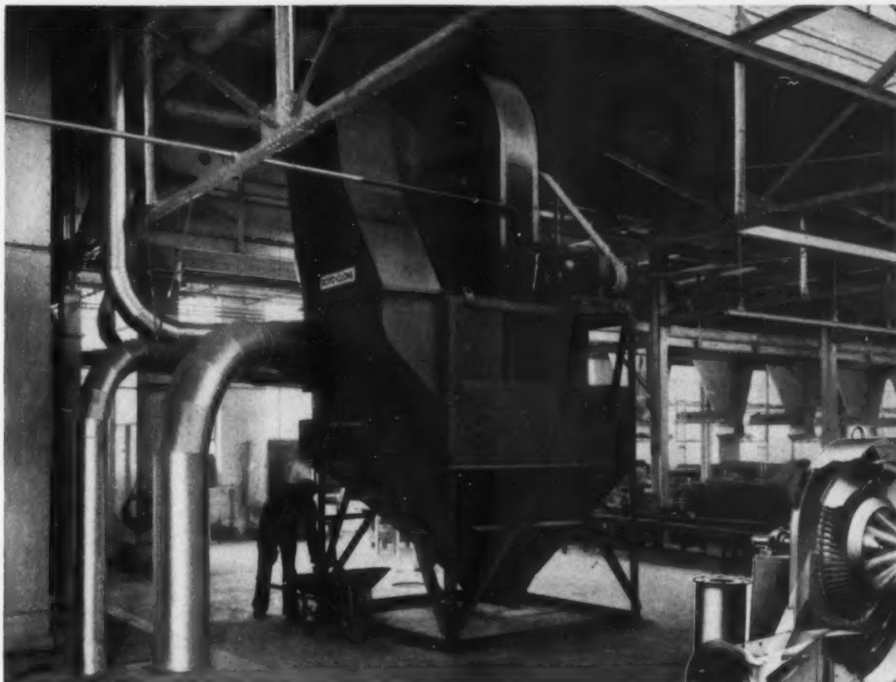
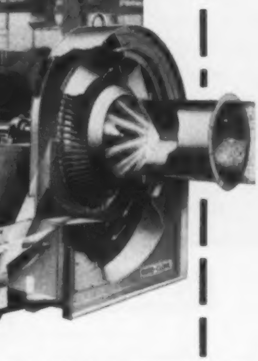


20th Century
the persuasive abrasive
If it's a question of uniformity, toughness, or economy in abrasives, use 20th Century *Normalized, our malleable shot and grit.
Normalized is providing a ready answer to all three questions in foundries and metal working plants everywhere.
Normalized wears 3 times longer than conventional shot.
*Copyrighted trade name
THE CLEVELAND Metal Abrasive CO.
801 East 67th Street Cleveland 8, Ohio
Howell Works: Howell, Michigan
One of the world's largest producers of quality shot, grit and powder—Normalized—Hard Iron—Cut Wire.

air as clean as you like it!



Type W ROTO-CLONE Arrangement C with hopper precleaner and automatic sludge ejection.



Type W ROTO-CLONE cutaway showing integral water sprays combined with dynamic precipitation for high efficiency collection over wide range of particle sizes.

ROTO-CLONE

"cleans house" for modern foundries

Dust is a costly bi-product of stepped-up production schedules

It seriously complicates good housekeeping, while maintenance costs increase proportionately. However, "engineered dust control" with AAF ROTO-CLONES is solving this problem economically and efficiently in many modern foundries. These versatile dust collectors save space and maintenance costs by combining all three functions of exhausting, separating and storing dust in one compact, efficient unit.

The Type W ROTO-CLONE above is one of three types and ten installations, which "clean house" for a large brass foundry. It's capacity of 15,000 cfm. serves to exhaust both shake-out and sand system operations. As an example of ROTO-CLONE operating economy this Type W has had only one parts replacement in seven years of continuous operation. This was one set of chains for the flight conveyor used to eject collected material in sludge form into the wheelbarrow shown in the photograph.

For better housekeeping at a substantial saving in operating and maintenance costs take a good look at ROTO-CLONE "engineered dust control". Call your nearby AAF representative today or write us for Engineering Bulletin No. 270A.

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American Air Filter

COMPANY, INC.

AAF

104 Central Avenue, Louisville 8, Ky. • American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California

STEVENS

PLUMBAGOS

High heat resistance. Smoother casting surface. Castings clean easier. Easy to apply. Make shake-out faster and easier.

CORE PASTES

Have good "green grab"—high tensile strength. Will not boil or swell out of joints. A grade for every purpose.

LIQUID PARTING

Economical—gives 20 to 60 molds per application. Eliminates dust from molding areas. Ideal for patterns for plaster molds—for match plates, loose patterns or core boxes.

CORE AND MOLD WASHES

Mix easily with water. Stay in suspension. Adhere firmly. Smooth, uniform coverage. Can be applied by brush, spray or dip. Reduce metal penetration. Easy, clean peel of sand from castings.

DRY PARTINGS

Safe to use. Economical. Make pattern lifts easier. Part sand cleanly from sand or pattern. Completely waterproofed.

MUDDING COMPOUNDS

Feed easily under thumb or fingers. Will not crumble or roll up. Will not curl under heat. Will not shrink, crack or peel. Prevents fins at joints.

PITCH CORE COMPOUNDS

Reduce cost three ways—cut down amount of new core sand used; allow use of old, burnt sand and gangway sweepings; reduce amount of compound used in proportion to the amount of reclaimed sand.

SEACOAL

Uniform grain size—jet black. Gives cleaner, smoother castings, easier shakeout. A grade for every purpose.

"EVERYTHING FOR A FOUNDRY"
TRADEMARK

FREDERIC B. **STEVENS** INCORPORATED

DETROIT 16, MICHIGAN

How Much EXTRA Are You Paying For Cores?

40 kw, 150,000 Btu Foundromatic dryer shown in high production foundry.

CHECK THE SAVINGS others are getting using the *Foundromatic* core dryer. It will pay you to find out what it can do for you in your foundry.

It's time you enjoy savings like these, too:

- Handling time cut 60-80%! Cores are placed directly on the moving conveyor belt of the dryer by the coremaker. In a few minutes they come out — cool enough to handle with bare hands — ready for the molder.
- Drying time cut 80%! Cores are dried in minutes instead of hours.
- Fuel cost cut 60%! All the heat goes into the core. In addition, unit can be shut off when not in use.
- Rejects reduced! Overbaking of cores and burning of fins and thin sections are eliminated.

If you investigated dielectric sand core drying a few years ago and decided that it wasn't ready, it's time you investigate again. Progress has been great. Seldom do you have the chance of enjoying such spectacular returns on your investment.

Call your nearby Allis-Chalmers district office for new booklet, or write Allis-Chalmers, Milwaukee 1, Wis.

A-3725

Foundromatic is an Allis-Chalmers trademark.

ALLIS-CHALMERS

QUESTIONS and ANSWERS

About Dielectric Sand Core Drying

1. *How does the core dry?*
By passing high frequency currents through the moist sand, the molecules are set in motion and the resultant friction generates sufficient heat to drive off the moisture from the inside.

2. *Why are resin binders used in place of core oils?*
Core oils require high temperatures and long drying time for complete polymerization. Resin binders cure at lower temperatures . . . approximately 250° F.

3. *What about collapsibility?*
Resin bonded cores have very good collapsibility, contributing to a faster, cleaner shakeout.

4. *I want a very hard core, but still have good collapsibility. What do I do?*
Spray the cores with a film of moisture just before putting on conveyor belt. This will give high surface hardness without affecting the collapsibility.

5. *Can core wash be eliminated?*
In many cases, yes. The resin forms a reducing atmosphere resulting in smooth castings, without necessity of applying core wash.

6. *Is any special or additional equipment needed?*
None, except plastic dryers to hold shaped cores. Marinite or transite plates are recommended.

7. *Can metal dryers or plates be used?*
Yes, but it will result in reduced production. The metal will act as a shield around the sand, requiring the core to be run a second time without the dryer or plate.

8. *I have metal dryers which I do not want to replace at once. Can I use them?*
Yes. Run the cores through in the normal manner. Turn the cores out on plates and remove the dryer and run the cores through again.

9. *How many plastic dryers will be needed?*
Far less than the normal amount of metal dryers. A maximum of 50 plastic dryers should suffice for each job unless more than one coremaker is working on the same job.

Allis-Chalmers
Milwaukee 1, Wisconsin

Please send me new 8-page booklet 15B7306B containing complete information on the *Foundromatic* sand core dryer.

Name ....
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Company ....
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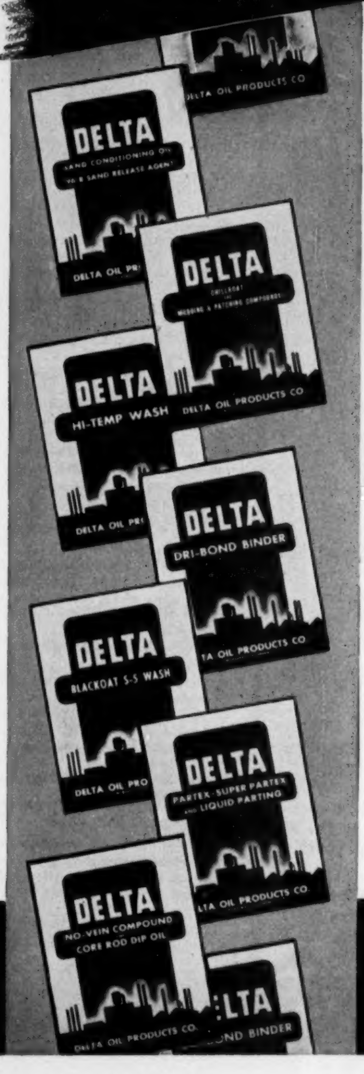

FOR FASTER PRODUCTION OF FINER-FINISH CASTINGS

... at lower cost!

FOR SAND

DELTA Permi-Bond (seacoal replacement)
Sand Conditioning Oils
96-B Sand Release Agent

FOR CORES

DELTA Core & Mold Washes for steel, malleable, gray iron and non-ferrous metals.
Mudding and Patching Compounds
No-Vein Compound
Dri-Bond Binder
Core Rod Dip Oils
Sand Conditioning Oils
Core Oils
Partex
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Bondite

FOR MOLDS

DELTA Core & Mold Washes for steel, malleable, gray iron and non-ferrous metals.
Partex (Nut Shell Parting)
Liquid Parting
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Bondite

The quality and uniformity of DELTA SPECIALIZED FOUNDRY PRODUCTS are laboratory controlled to insure consistent results in use. Liberal working samples, together with complete instructions for use will be sent to you without cost or obligation. WRITE TODAY.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF
SPECIALIZED FOUNDRY PRODUCTS
MILWAUKEE 9 • WISCONSIN

"No other furnace could do the job"

This foundry casts parts for corrosion- and heat-resistant valves . . . pressure-tight castings of hard-to-handle nickel alloys and stainless steels.

Requirements are *tough*. Shapes cast are complex, with complicated coring. Analysis must be controlled within extremely close limits, must be absolutely uniform throughout the melt. Because any variations in composition might be a starting point for corrosion, welding repairs are undesirable.

Ajax-Northrup high frequency furnaces meet these requirements with ease. Pouring temperatures are controlled within ± 20 deg.F., each melt being poured at the point of optimum fluidity. Analysis of every element is controlled within 0.25%, carbon kept as low as 0.03%, when desired. Uniformity is assured by the inherent stirring action of induction furnaces.

The resulting castings are so consistently sound that *repair welding has been eliminated!* Parts with even minor defects are so few that they are scrapped instead of being welded.

Output is high. With never more than one 600-pound furnace in operation, on a two-shift basis, this small foundry pours almost 250,000 pounds of high-melting point alloys a month! No wonder the foundry superintendent says "No other furnace could do the job."

Ajax-Northrup can do a better job for you, too. Write us today for details.

SEND FOR NEW INDUCTION HEATING AND MELTING BULLETIN

137

FOR HEATING AND MELTING

AJAX ELECTROTHERMIC CORPORATION

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AJAX ELECTRIC FURNACE CORPORATION
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AJAX ENGINEERING CORPORATION

products and processes

For additional information,

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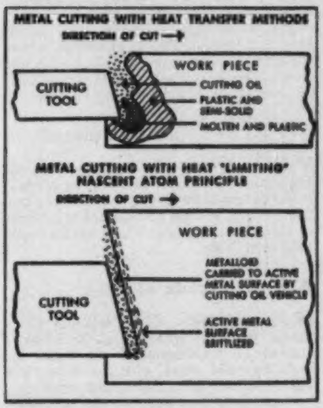
601 Vertical lift

Hydraulic lift may be used for stationary installations or as a mobile unit. Its 24 x 60-in. platform is only 7⅛ in. from the floor in lowered position and 30 in. from the floor raised. Lifting power is obtained by a foot-operated hydraulic pump built into the base. A power-operated pump may be substituted if power operation is required. The parallelogram arrangement of lifting arms and slide connections at the platform frame makes the platform lift straight up from the base. Unit is called Lange-Lift. *Lange Lift Co.*

602 Machining aid

Use of a chemical compound named Metalloid X-30 has yielded increases of 900 per cent in some instances of thread chasing and tapping. In practically all cases, speeds and feeds have been increased 25 to 35 per cent. Compound produces a result somewhat like the physical changes in steel being hardened by nitriding or carburizing. It has none of the heat transfer properties of conventional cutting oils, but will use any cutting oil as a vehicle. Limiting plastic deformation or flow at the point of cut, it acts to reduce temperatures of tools and work well below the critical point at which tool hardness is affected. Its use is said to eliminate built-up edges on tools. Manufacturer reports it to be practical for control of heat and extension of tool life for any metal machining operation, including turning, broaching, gear cutting, drilling, milling, threading, and tapping. It is completely soluble in all types of petroleum oils and solvents, and can be easily removed by vapor degreasing or emulsion or alkaline cleaning solutions. It does not stain, is non-toxic and non-irritating. *Metalloid Corp.*



603 Kills metal fires

Dry powder known as Met-L-X is used in pressurized extinguisher designed to smother fires in metals such as magnesium, sodium, potassium, zinc, and powdered aluminum. The powder forms an air-excluding crust over the burning metal as it contacts the flames. With oxygen excluded, the fire dies. Powder is moisture-repellent, non-toxic, non-corrosive, and non-abrasive. It does not conduct electricity and will not deteriorate under normal conditions. Extinguishers are being made in 30, 150, and 300-lb sizes. Automatic piped systems are also being made. Extinguisher is available only on Defense Order. *Ansul Chemical Co.*

604 For air lines

The Vi-Speed Air Drier removes moisture, oil, dust, dirt, smoke, and scale from compressed air and gases; reduces humidity below the condensation point; and acts as a storage tank. The only attention needed is the addition of a small amount of filter material about once a month. It is available in two sizes, Model 25 delivering 25 cfm and Model 200 delivering 200 cfm of air at 100 psi. *Van Products Co.*

605 Film illuminator

Four 14 x 17-in. x-ray films may be viewed side by side on the 4-in-1 Circline Illuminator. Unit measures 57 wide by 20½ high by 7 in. deep, and may be wall-mounted, wall-recessed, or set on a mobile stand. Across the full 4-panel width is a plastic sheet to diffuse the light, covered by a sheet of protective clear glass. *General Electric Co.*

606 Fixes porous castings

Salsbury Seal System will save porous castings from the scrap heap. It consists of the introduction of "Irontite Seal" into the cracks and pores. System also works on cracked cylinder heads and motor blocks. *Salsbury Corp.*

607 Top-fired furnaces

Oil or gas-fired Markley top-fired standard size crucible furnaces are available in single or twin units in sizes from No.

Continued on page 110

Reader Service Dept.

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611 Roof ventilators

Slanted right at foundries and steel mills, 4-page Form 40 gives dimensions and performance ratings of power roof ventilators. Material is clear, concise, well organized. Cutaway drawing shows construction. *Iron Lung Ventilator Co.*

612 Four-rope buckets

Thorough coverage of four-rope buckets used primarily on overhead or bridge cranes is offered in 44-page Bulletin 2302. Bulletin features a list of ten vital items for guidance in purchasing such a bucket, explaining how to prepare an inquiry. There are numerous illustrations of bulk material handling including coal, ores, etc., with performance data and comparisons. To provide further assistance, helpful information and diagrams are presented on types, reeving, arrangement of cables for various types of cranes, cable life as influenced by sheave diameter, and how to determine the increase in payload through use of anti-friction bearings in bucket sheaves. *Blaw Knox Co.*

613 Cut-off machines

Complete line of units with five models for samples from ½-in. to 3-in. diameter is covered in folder, "Specimen Cut-off Machines". *Buehler Ltd.*

614 Grinder wheel guards

Various types of grinding wheel guards are described and illustrated in 4-page bulletin. There are guards for standard wheels, for small wheel grinders, for flexible shaft equipment, for disc-type wheels, for flaring and straight cup snagging wheels, and for special services. *Morrison Products, Inc.*

615 Photocopier

Small, 12-page brochure, "Auto-Stat", gives salient details on a machine for making copies of paperwork. It will produce a black-on-white copy in less than 45 seconds. Copies anything written, printed, typed, drawn, or photographed, regardless of whether the original is on one or both sides, on opaque or translucent paper. There are no restrictions on the material, texture, or color of the originals, provided two colors are not superimposed. No developing, fixing, washing, or drying; no exhaust pipe or ammonia fumes; no expensive installation. Machine works on transfer facsimile principle. *American Photocopy Equipment Co.*

616 Floor resurfacer

Floor patching and resurfacing material composed of pulverized natural rubber, asphalt-rock limestone, and cold asphalt emulsion is described in two-page folder. Material is factory-mixed, is easily and quickly laid, and will handle heavy traffic immediately. *Flash-Stone Co. Inc.*

617 Electro-analysis manual

Working manual outlining methods for the analysis of copper and lead by electro-analysis contains 30 pages. Methods and the extensive bibliography are a product of research at Battelle Memorial Institute. *Eberbach Corp.*

618 Electrode selector

Four-page tabular chart, Bulletin GEC-657-B, presents latest condensed information on recommended electrodes for welding mild steel, stainless steel, low hydrogen-low alloy steels, low alloy-high tensile steels, cast iron, bronze, and similar metals. *General Electric Co.*

619 Industrial trucks

Electric industrial trucks are described in 4-page condensed catalog. Construction and performance data are presented, along with a line of attachments for fork trucks that extend their use. Various fork and lift trucks, tractors, cranes, and platform trucks are included. *Automatic Transportation Co.*

620 Air compressors

Complete engineering data on Type M motor-driven industrial air compressors is contained in 4-page, illustrated Bulletin M-65. Compressors range from 250 to 1000 hp with standard 2-stage units and from 300 to 1000 hp with standard single-stage units. *Cooper-Bessemer Corp.*

621 Engineering services

Engineering services available are described in 4-page folder. These services include the design of buildings, foundations, and equipment as well as project coordination and control. *York Engineering & Construction Co.*

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CITY AND ZONE


A hit of the Foundry Congress...
Fremont's New
SPREADLOCK FLASK
Long-life, easily replaceable, live rubber corner inserts completely close the corner gaps so that no sand can lodge in the open corners. No springs to break or lose their resiliency.
This great development in flasks also embodies all the many advantages of Fremont's popular standard magnesium slip flasks, being lighter in weight, thus easier to handle and assuring longer service, more exacting work.
Write today for literature.
THE FREMONT FLASK COMPANY
FREMONT, OHIO

LEADING FOUNDRIES WILL TELL YOU—

You just can't miss

If your aim is BETTER IRON, BETTER CASTINGS, MORE EFFICIENT CUPOLA OPERATION

WITH LESS DOWN TIME AND GREATLY REDUCED MAINTENANCE COST, YOU'LL HIT THE BULL'S-EYE BY USING—

Famous CORNELL CUPOLA FLUX

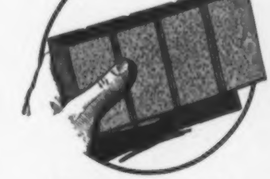
WITH EVERY CHARGE OF IRON.

Famous Cornell Cupola Flux has a part in every day production in hundreds of foundries because it has proved itself an indispensable guardian of casting quality, and keeps rejects at a minimum.

It not only does a thorough job of cleansing molten iron, but makes it more fluid, and reduces sulphur. Castings are cleaner, sounder and easier to machine.

> Gray iron foundries are not alone in the praise of Famous Cornell Cupola Flux—malleable foundries, with cupolas, say it gives their castings a much better start.

It keeps cupolas cleaner. Drops are cleaner. Bridging over is practically eliminated. And there is less erosion of brick or stone lining—minimum down time for patching and replacement.



Pre-Measured
SCORED BRICK FORM

Easy to use. Permits the use of the exact amount needed for your cupola charge, eliminates waste.

WRITE FOR BULLETIN NO. 46-B

The Cleveland Flux Co.

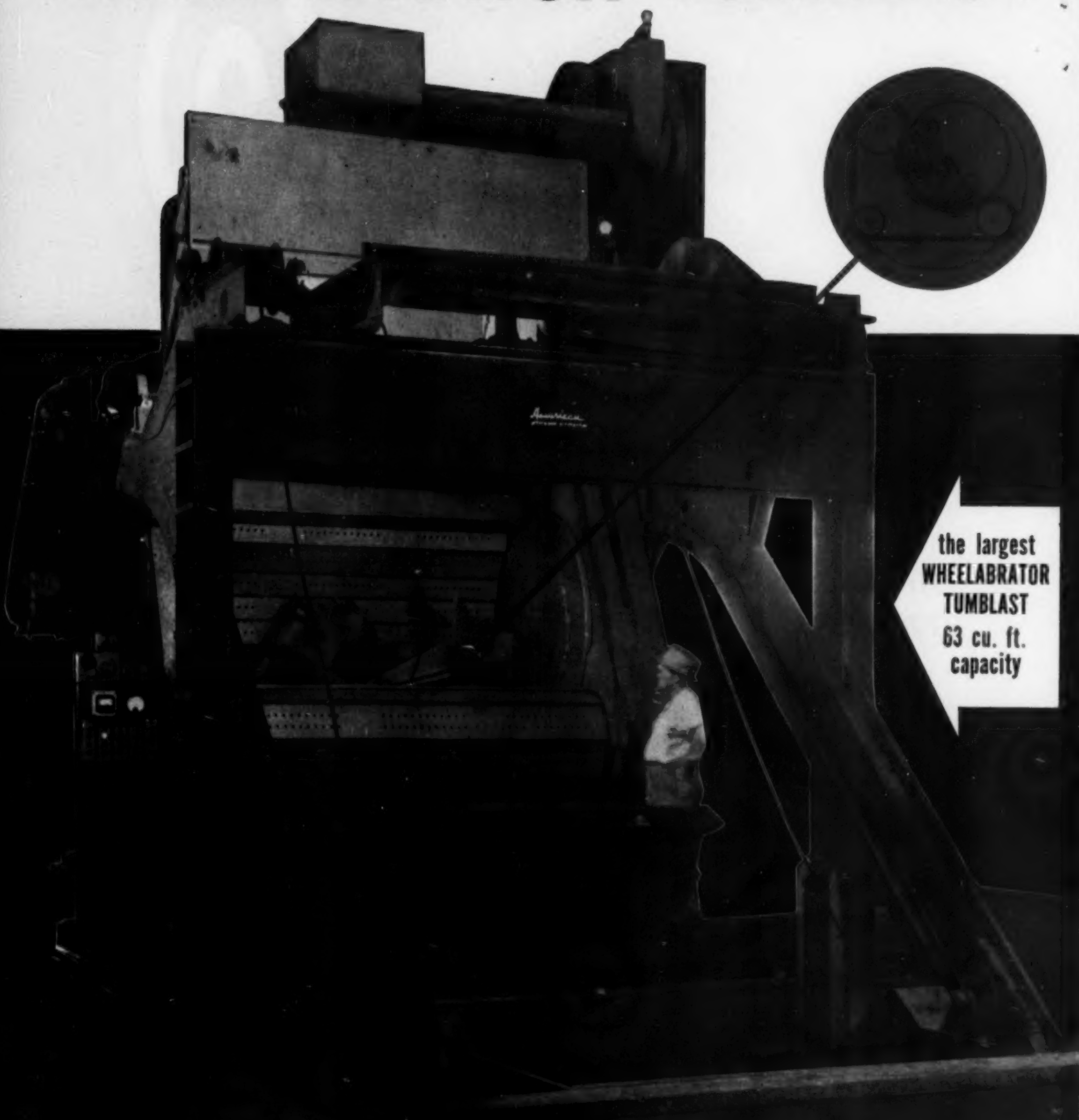
1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS FLUXES
Trade Mark Registered

BRASS FLUX	FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.
ALUMINUM FLUX	FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

WHEELABRATOR® TUMBLAST



AIRLESS BLAST EQUIPMENT

HAS REVOLUTIONIZED BLAST CLEANING FOR 26 YEARS

• FIRST with endless belt conveyor

• *4350 ENTHUSIASTIC USERS*

The *original* airless batch mill that transformed metal cleaning to a mass production operation over 26 years ago, is still the fastest, most thorough and most economical cleaning method today. Constant improvements have been made in the Wheelabrator Tumblast, still its *basic engineering features* have always proved to be years ahead of other designs.

For instance, the endless conveyor method of tumbling the work and the incomparable Wheelabrator unit have saved thousands of dollars in operating and maintenance costs for more than 4350 Tumblast users. Work is gently cascaded in a continuous cycle beneath the blast stream so that all surfaces of every piece are exposed to the full effect of the cleaning action.

American's engineering leadership and vast experience with the proven Wheelabrator Tumblast is your *absolute assurance* of a thorough, fast and economical cleaning job.

there's a WHEELABRATOR TUMBLAST for every size foundry

8 SIZES TO CHOOSE FROM

American

WHEELABRATOR & EQUIPMENT CORP.

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

How Ladle Inoculants Reduce Chill . . . Produce High-Strength, Machinable Iron

One of the most significant developments in the field of cast iron metallurgy during recent years has been the widespread growth of the process of "inoculation" in producing quality metal to strict specifications. Inoculation has been defined as "a process in which an addition is made to molten cast iron for the purpose of altering or modifying the micro-structure of the iron and thereby improving the mechanical and physical properties to a degree not explainable on the basis of the change in composition."*

Various ladle addition alloys are used for inoculation of cast iron, but there is a wide range in the efficiency and potency of these materials. The 50 per cent and 75 per cent ferrosilicons are mild inoculants, but they are used as ladle additions principally as a means of adjusting the silicon content of cast iron. The 85 per cent and 90 per cent grades of ferrosilicon are much more effective inoculants. Inoculating power is further improved through the use of special inoculating alloys, such as silicon-manganese-zirconium ("SMZ" alloy) and calcium-silicon.

*Definition by H. W. Lownie, Jr.—A.F.S. Symposium on "Inoculation of Gray Cast Iron."

ELECTROMET produces a number of alloys for inoculation, each of which has specific applications. The graphitizing inoculants are:

"SMZ" Alloy	60-65% silicon 5-7% manganese 5-7% zirconium
Calcium-Silicon	30-33% calcium 60-65% silicon
90% Ferrosilicon	92-95% silicon
85% Ferrosilicon	83-88% silicon
Special Graphitizer	A mixture of ferrosilicon and graphite for special uses.
75% Ferrosilicon	73-78% silicon
50% Ferrosilicon	47-51% silicon

These inoculants are usually added to the molten iron as it leaves the cupola spout, or during transfer from one ladle to another.

"SMZ" Alloy—An Efficient Inoculant

The benefits of inoculation are obtained largely as the result of rigid control of the structure of the graphite phase of cast iron which has received this treatment. The results of inoculation on the properties of a typical cast iron are demonstrated by the accompanying illustrations showing the effect of adding various amounts of "SMZ" alloy.

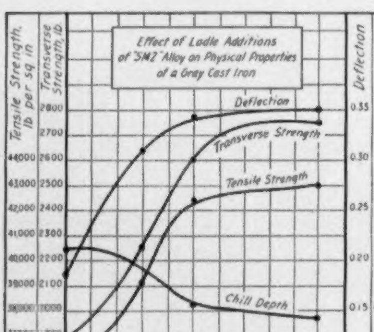


Fig. 1—These curves show how additions of "SMZ" alloy reduce depth of chill and improve mechanical properties when added to a series of irons selected to give the following final analysis: 3.10 total carbon, 0.60 combined carbon, 1.80 silicon, and 0.50 manganese.

Effects of Inoculation

The effects of graphitizing inoculants are: a drastic decrease in the chilling tendency of a given iron, a mild decrease in Brinell hardness, lowering of the section sensitivity of the metal, a definite increase in tensile strength, and an increase in transverse strength and deflection. These benefits are usually accompanied by improved fluidity, better castability, and improved resistance to wear.

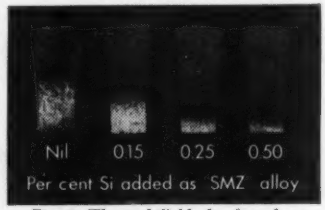


Fig. 2—These chill blocks show how progressive additions of "SMZ" alloy reduce the depth of chill.

New Stabilizing Inoculant

For the production of cast iron, ELECTROMET developed recently a special low-carbon foundry ferrochrome. This silicon-chromium alloy is so balanced in composition that it increases the strength and hardness of gray iron, without increasing chill. The new alloy has a nominal analysis of 30 per cent silicon and 50 per cent chromium. It has excellent solubility in iron, and the inoculating effect of the silicon content makes it possible to add up to 1 per cent chromium to gray iron as a ladle addition, with no appreciable increase in chill. Castings treated with the new alloy have an excellent balance between machinability and good resistance to wear.

Booklets Available

Further information about ladle inoculants is given in the booklets, "SMZ Alloy and Its Uses as a Ladle Addition to Cast Iron" and "Silicon-Chromium Alloy in Complicated Iron Castings." You may obtain copies, free of charge, by writing or phoning to the address given above or to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

Foundrymen in the news

R. W. Munger

R. M. Sellers

Robert M. Sellers and **Robert W. Munger** have been promoted to manager of Electric Auto-Lite Co. foundries at Fostoria, Ohio, and Mount Vernon, Ill., respectively. Both veteran employees of the firm, they will report to **W. J. Valter,** manager of the division.

Cecil F. Semrau, who draws credit for the smokeless cupola light-up article which appears on page 49, started in 1928 as office boy at Illinois Malleable Iron Co., Chicago, and worked his way up through the laboratory to his present position as metallurgist. He is also a director of the Chicago chapter of A.F.S. A graduate of Carl Schurz high school on Chicago's Northwest side, Mr. Semrau filled out his formal education by attending night courses in metallurgy and metallography at Lewis Institute (now Illinois Institute of Technology).

Harry G. Mitchell, Speer Carbon Co., St. Marys, Pa., has received an award for outstanding accomplishment in the advancement of powder metallurgy from the Metals Disintegrating Co., Union, N. J. Dr. Mitchell has pioneered in powder metallurgy since 1926 and has made several notable contributions, including metal-graphite brushes. He also developed a therapeutic carbon and conducted extensive research on electrolytic anodes.

W. E. Todd is the newly appointed southern manager for the Pre-Engineered Div. of Mechanical Handling Systems, Inc., Detroit. He has been in the business for 17 years. Office is in Cincinnati.

Marcus E. Borinstein, former vice-president in charge of merchandising of James Flett Organization, Inc., has joined the LaSalle Trading Co., scrap metal brokers, Chicago. Borinstein served as chief of the scrap section of the Office Chief Ordnance, Army Service Forces, during the last war.

Lester O. Pfahl has joined Hooker Electro-chemical Co., New York, as a mechanical engineer in the operation department. Also added to the staff have been **Brantford H. Dietrich** as plant engineer and **Arthur S. Cookfair** as laboratory assistant in the research department.

Laurence H. Carr, director of research and engineering for Edward Valves, Inc., East Chicago, Ind., is one of the co-authors of the article, *"Standardizing casting practice"* that starts on page 42 of this issue. A graduate of the University of Chicago in 1932, Mr. Carr began his industrial career with Wisconsin Steel Co. of Chicago. In 1936, he joined Edward Valves and has been with them ever since. Co-author **A. S. Grot,** plant metallurgist, graduated from Purdue University in 1934 with a degree in Chemical Engineering. From then until 1945 he was with Taylor Forge & Pipe Works, Cicero, Ill., advancing from welding development engineer to chief metallurgist. After one year as partner and works manager for Thermo-Met Co., Chicago, he moved to Edward Valves, where he has charge of production control and trouble shooting.

A. S. Grot

L. H. Carr

Leighton M. Long, author of the non-ferrous ingot article on page 53, was born and educated in Canada. After working as a chemist for Chas. D. Kawin, Toronto; Dominion Grain Research, Winnipeg; Algoma Steel Corp., Sault St. Marie; and Michigan Smelting & Refining Corp., Detroit; he became a metallurgist for Bunting Brass & Bronze Co., Toledo, later advancing to chief metallurgist and foundry superintendent. Leaving Bunting in 1943, he was research supervisor for Battelle Memorial Institute, Columbus, Ohio, for a year, and since then has been a consultant in brass and bronze foundry practice. He is a past chairman of the A.F.S. Toledo chapter.

L. G. Graper and **G. C. McBroom** were recently elected vice-presidents of Lone Star Steel Co., Dallas, Texas, and of its wholly owned subsidiary, Texas & Northern Railroad.

Samuel Zelin has been appointed vice-president and treasurer of Cooper Alloy Foundry Co., Hillside, N. J. He has been with the firm for 25 years, and at one time or another has handled or directed practically every operation in the plant.

Thomas E. Lund, burning foreman in the Foundry Div. of Omaha Steel Works, Omaha, Neb., has been awarded the

T. T. Lloyd

C. S. Lawson

J. S. Schumacher

Carnegie Hero Medal plus a cash award of $500 and $50 per month disability benefits for his act of bravery in saving human life. Mr. Lund snatched a boy from the path of an out-of-control racing car that had crashed through the guard rail at an automobile track. Lund was seriously injured, but is now back at work on a part-time basis, with a steel brace on his leg.

Thomas T. Lloyd, who wrote the vocational training article which starts on page 78, has worked for Albion Malleable Iron Co., Albion, Mich., since the start of his industrial career in 1936. A graduate of Culver Military Academy and Cornell University, Mr. Lloyd rose from molder to salesman to vice-president & works manager to his present position as vice-president & manufacturing manager. He is active in both the Malleable Founders' Society and in A.F.S. and is chairman of the Society's Central Michigan chapter.

James M. Robertson has been moved up from head of the laboratory to chief chemist in charge of quality control at all plants of Wellman Bronze & Aluminum Co., Cleveland. **Robert C. Boehm** is the company's new chief metallurgist, and **Robert W. Spacek** has been named assistant production manager for all plants.

C. W. McLennan, personnel director of Lynchburg Foundry Co., Lynchburg, Va., has been appointed by Virginia's Governor Battle to serve as chairman of the State Apprenticeship Council. Mr. McLennan has served on this council as an employer representative since June 1949.

W. S. Schamel, former sales engineer for Dust & Fume Control Div., American Wheelabrator & Equipment Corp., Mishawaka, Ind., has been advanced to assistant technical director. **G. W. Reper, J. K. Davidson,** and **F. A. Lindahl** have been named project engineers.

Claude S. Lawson was elected president and chief executive officer of United States Pipe & Foundry Co., Burlington, N. J., at a recent meeting of the board of directors. **Norman F. S. Russell** was re-elected chairman of the board, and **James J. Reynolds** was elected vice-president at the same time.

C. Dale Dickinson, research engineer for Allis-Chalmers Mfg. Co., Milwaukee, has been awarded an Allis-Chalmers fellowship for 12 months of resident study for a PhD in metallurgical engineering. He has enrolled at the University of Michigan.

Bruce K. Stabelfeldt, formerly with Edward Valves, Inc., East Chicago, Ind., and with Blackhawk Manufacturing Co., Milwaukee, has joined the staff of Waldie and Briggs, Inc., Chicago.

Harry S. Wells has resigned as staff plant engineer of Chrysler Corp. after over 36 years of service with Dodge and Chrysler in Detroit. Mr. Wells was born in Nottingham, England, in 1884, and came to the United States in 1907. After 8 years with Murphy Iron Works (now Riley Stoker Corp.) in Detroit, he joined the staff of Dodge. In 1939 he was appointed to his position with Chrysler. Assuming the job of staff plant engineer will be **John von Rosen,** an employee of Chrysler since 1932.

Joseph S. Schumacher, author of *"Foolproof sand,"* page 54, has had a varied career since graduating from Ohio State in 1936 with a degree in Industrial Engineering. At various times he has worked for Merchants National Bank, Hillsboro, Ohio; Yardley Screen and Weatherstrip Co., Columbus, Ohio; Cincinnati Milling Machine Co., here as foundry supervisor, metallurgist, and sand control man; and is now with Hill & Griffith Co., Cincinnati, as chief engineer and director of research. He is active in local A.F.S. activities and is a past chairman of the A.F.S. Cincinnati chapter.

Herbert R. Palmer, for 30 years with Ajax Metal Co. and with H. Kramer & Co., has joined the sales force of North American Smelting Co., Wilmington, Del.

Everett G. Couch Jr. was recently appointed plant manager of the Taylor, Ky., works of Chas. Taylor Sons Co. He has been with the firm since 1943.

Wilton G. Smith is new district manager of the mid-central territory of Hyster Co., Portland, Ore. He previously served as manager of the firm's Washington office.

American foundrymen on this team of advisors to the Italian foundry industry are, left to right: D. Frank O'Connor, O'Connor's Foundry, Hackettstown, N. J.; Thomas A. Cutri, Mingo Junction, Ohio; Team Chairman Arthur J. Mulvahill, Mulvahill Car Wheel Foundry, Lebanon, Mo.; Kenneth M. Smith, Hansell-Elcock Co., Chicago; and A. W. Paris, consultant, Aurora, Ill. This and similar MSA teams advise other countries on U.S. mass production casting methods.

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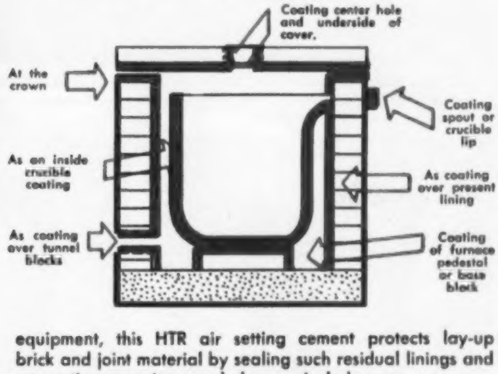
...and this is the Fusing Method that will increase your non-ferrous metals melting production...

APPLY HTR PLASTI-BOND COATING TO THESE POINTS ON FURNACE AND CRUCIBLE



This HY-TEMP REFRACTO quick setting cement, PLASTI-BOND, offers you the refractory plus-factors that transform "down-time" hours into pounds of metal melted.

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Resistant to slag and other harmful oxides that adhere to ordinary linings, PLASTI-BOND protects metals in heat from contamination and analysis breakdown. Broad field experience has proven that this HTR super-refractory, plastic in substance, will prolong the heat-life of the furnace and INCREASE CRUCIBLE-LIFE 50% TO 100%!

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Industrial Equipment round bottom pressed steel ladle bowl, 50 lb. capacity, type 7 flat side.

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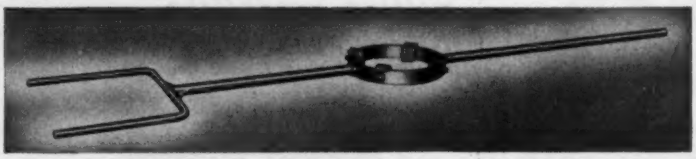
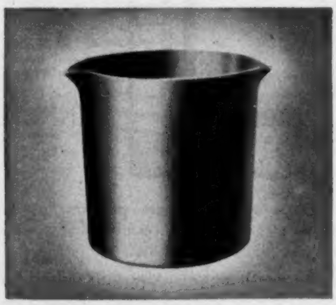
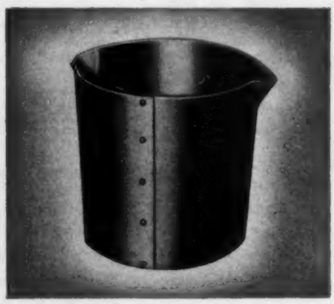


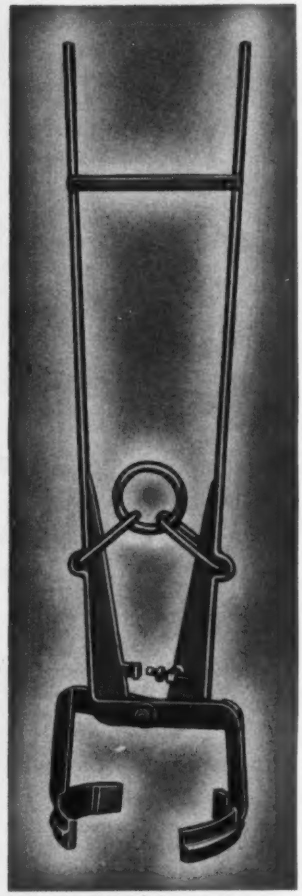
Industrial Equipment type 30CA single and adjustable ladle and crucible shank. Four-point suspension . . . easily adjustable . . . no springs . . . air cooled band. Fixed band types also available.



Industrial Equipment type 514 flat bottom welded steel ladle bowl. Available in almost any size or thickness.



Industrial Equipment 537 flat bottom riveted steel ladle bowl.



Type 72C crucible tongs. Adjustable. Four-point suspension. Claw types also available.

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Build little ideas into big ones . . .

H. W. Dietert

■ We often appraise one who comes up with new ideas or plans as a genius. This is not necessarily true since an every-day mind may be trained to accomplish the same constructive thinking. Several simple steps are necessary.

First, we must recognize that new ideas can be built as one builds a structure—one brick upon another, step by step. It is not possible or logical to build a structure all at once in a single step. Neither do we develop a major plan in one step. Instead, we should select the objective—the thought structure, then divide it into small components.

One component is selected as a starting point and this thought is developed to the fullest extent. Then a second thought is developed fully. The process continues, section by section, thought by thought, with concentration on each, one at a time.

After completion of step by step sectional thinking, the summation of the individual thoughts into the assembled thought structure begins. Each thought is placed with the others in a chosen order.

The components, when assembled, form a base for further thought refinements and additions. This leads to the final thought development which often appears complicated and the product of a genius. In fact, all that is required is the thought building process which grows by selecting small, simple divisions of a problem and solving these one at a time before proceeding to the next division.

Exercising control over the mind in selecting division and concentrating on each separately is a procedure in thought building that is readily applicable to solution of foundry problems.

For each foundry problem, first have a clearly defined objective. Second, divide the problem into a series of small divisions or sections. Third, study and resolve each division; reach a definite conclusion. Fourth, assemble divisional conclusions into a single plan for action.

HARRY W. DIETERT / *President*
Harry W. Dietert Co.
Detroit

Start Tennessee foundry safety program . . .

■ Injury frequency rate in Tennessee foundries will be determined from a study initiated June 1 by the Division of Workshop and Factory Inspection of the Tennessee Department of Labor. Both ferrous and non-ferrous shops are included in the study which will be followed by a safety program sponsored by the Division. Object is to reduce injuries.

What's new in foundry equipment

■ For the 1952 International Foundry Congress, a group of foundry experts was invited by AMERICAN FOUNDRYMAN to roam the huge Atlantic City Convention Hall, study new tools displayed by the exhibitors, and report on them for the foundry industry. The first half of their story follows. Observers reporting this issue are: Herbert J. Weber, chief industrial hygienist, American Brake Shoe Co., Chicago; J. E. Rehder, foundry engineer, Canadian Department of Mines & Technical Surveys, Ottawa, Ont., Canada; R. J. Wolf, engineer, Stone & Webster Engineering Corp., Boston; George W. Anselman, vice-president and foundry superintendent, Beloit Foundry Co., Beloit, Wis.; Prof. Richard A. Flinn, University of Michigan; and E. J. McAfee, master patternmaker, Puget Sound Naval Shipyard.

Automatic shell molding machine has heating elements cast in pattern plate.

British molding machine features standard machine tool finish, novel design.

Self adjusting lift pins eliminate difficulties due to flask irregularities.

New departure in conveyors gives flexibility in large and small foundries.

Push button shell molding equipment cures by infra-red heat, operates easily.

Shell molding

Foundrymen looking for the first showing of mechanized shell mold production were not disappointed. Two plastics companies had operating exhibits and several engineering firms showed drawings or pictures of equipment in use or under construction. One completely automatic machine comes in two table sizes, 20 x 30 in. and 26 x 41 in. The sand and resin mixture was dumped onto a pattern (heated electrically by elements cast into the pattern plate) after spraying the liquid parting, cured, and stripped. Cycle was 33 seconds, exclusive of spraying and curing which depends on the particular pattern. One operator could run two machines. Curing can be accomplished by electricity of gas.

The other operating exhibit of shell molding featured a machine performing all basic operations mechanically with the pattern heated by oven. The latter lengthened the cycle which is expected to be remedied through the use of strip heaters on the pattern plate. Shells produced in this operation were cured by infra-red radiation and were held together by an adhesive instead of metal fasteners and poured without the customary shot or sand backing.

Non-operating displays of shell molding equipment gave foundrymen a preview through drawings of a two-station machine on which sand will be dropped on the pattern through overhead louvres, and through pictures of a four-station installation now in operation in a large Southern foundry.

Compact sand control unit automatically tests and controls mechanical properties.

New heavy duty dust and fume collector.

Slinger head automatically traverses flasks brought into position by turntable. Unit rams 100 complete molds per hour without operator attention.

Molding equipment

Examination of molding equipment of traditional types showed that an outstanding feature of an overseas machine was its standard machine tool finish. This should promote pride in equipment, pride in workmanship, greater cleanliness, and reduced maintenance. Such a finish is another step toward making the foundry a better place in which to work.

A machine especially adapted to stack molding which combined blowing and squeezing was shown for the first time.

A new, automatic hydraulically operated slinger has been developed for highly repetitive work. Completely automatic with no manpower required for operation, this slinger

R. A. Flinn

J. E. Rehder

G. W. Anselman

R. J. Wolf

E. J. McAfee

H. J. Weber

traverses the flask under cam control to produce as high as 100 complete molds per hour.

Another automatic molding machine conveys flasks to and from the machine, discharges a predetermined quantity of sand into the flask, jolts on a time cycle, squeezes, and withdraws the pattern on the down stroke of the squeeze piston. Time required for making a cope or drag is approximately 15 seconds.

A self-adjusting lift pin shown by another company solves the problem of getting even contact at all four corners of warped, crooked, or warm flasks. The pin automatically and instantly compensates for warpages up to ⅜ in. and fits on all standard pin lift machines without alteration.

Materials handling

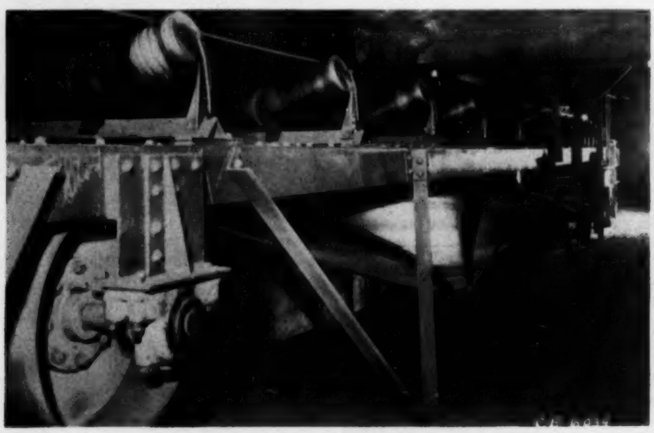
Producers of materials handling and related equipment showed by their exhibits that they seem to be attacking the complex problem of foundry material movement with a fresh and more varied outlook. With no two foundries alike in layout, product, and personnel, equipment producers aid the foundryman by giving him a wide field of choice.

In the field of power conveyors, the industry seems to be using vibrating conveyors for certain applications where belt or apron conveyors were formerly recommended. Widely recommended is a shakeout for small and medium sized molds in which a double-deck unit is used to separate castings, gates, and sprues from the sand. Single deck units are being used for handling castings for rough sorting, for feeders out of sand bins, and under vibrating shakeouts in place of apron conveyors where the volume of sand in a mold is not too great. The units are of rather simple construction with few moving parts and when properly used should give a good account of themselves.

One company has developed a simple conveyor system which consists of two rails of strip steel mounted on edge on which run cast aluminum bottom boards equipped with small, self-cleaning recessed rollers. The system can be gravity or manually operated.

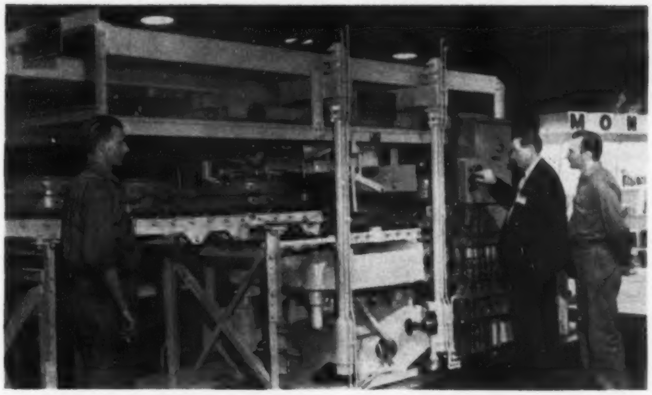
A new shakeout displayed will handle molds with or without barred drags. An unusual turnover belt originally developed for the mining

Dual furnace is induction heated, gives carbon and sulphur determinations.

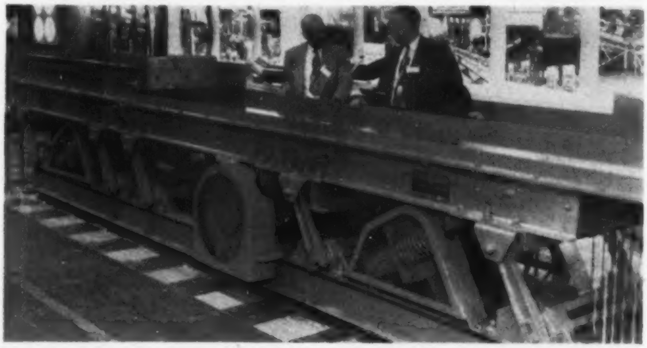


Turnover belt twists through full 360 degrees on its return, presents underside of belt to idlers, eliminating build-up on idlers and wear and tear on belt.

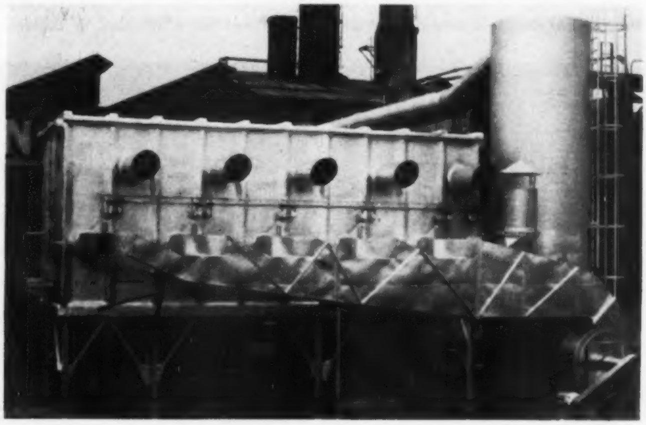
Complete lubrication is achieved by means of microscopic particles of oil.



Automatic machine and a single operator turn out molds at rate of 15 seconds per cope or drag. Sand loads automatically, pattern draws on down stroke of piston.



Shakeout unit combines features of shakeout and oscillating conveyor to remove castings and sand from copes and drags with or without flask bars.



Bag house of West Coast cupola emission control unit. Water scrubbers remove large particulate matter, synthetic fiber bags complete the job.

industry was offered to the foundry industry this year. It solves problems created by buildup of material on the belt or return idlers. Applicable to existing as well as new installations, the turnover is achieved through a 180 degree twist immediately after the belt leaves the head pulley on its return and an additional 180 degree twist just before the tail pulley.

A newcomer in the conveying field exhibited a device for measuring or controlling the amount of granular material in a bin. A simple, mechanical arrangement operates a relay to start and stop equipment feeding into the bin. The same company has developed an open screw conveyor with a variable speed drive which can be used with the measuring device for eliminating large sand storage hoppers at molding stations. A small, non-clogging hopper with the large end down has been developed for the open screw conveyor.

For forking hot castings out of sand, two companies collaborated in developing a tine bucket which can be substituted for the usual power scoop now available. The tine bucket is being substituted for manual handling in foundries where molds are shaken out on the floor.

Innovations in cranes are a hydraulic coupling between bridge and trolley drives and a magnetic control which permits control of three crane movements with only two levers.

Oil mist lubrication, which carries oil as a fine mist to points to be lubricated by means of low pressure air, was shown to the foundry industry for the first time in Atlantic City. The system provides automatic, central lubrication with no moving parts and is designed for use where many conventional oil or grease systems are applied.

An air operated pump unit for removing lubricating or core oils from steel drums fits into the bung of the drum and empties it while on end. A meter in the discharge hose is equipped with an automatic shutoff valve similar to those used on a gasoline station pump.

Testing and control

Outstanding in testing and control equipment exhibited at the International Foundry Congress were an automatic sand testing and control unit, a betatron, a completely integrated spectrographic analysis laboratory in a single unit, and a high-frequency combustion instrument for determining carbon and sulphur. The new sand control unit provides

for automatic tempering of sand to a given workability. While a batch of sand is being mixed, samples are taken automatically, rammed, and tested for deformation, green compression strength, temperature, and permeability. Strength and permeability are recorded on charts and water is added to the mixer until deformation has reached a desired value. The batch is dumped and the mixer is ready for another load. Entirely automatic, the testing cycle can be varied from 15 to 360 seconds.

The betatron is a commercial application of a tool formerly used only in advanced research. It will make x-ray type examinations in considerably shorter time than standard x-ray equipment. Techniques are similar to x-ray procedures.

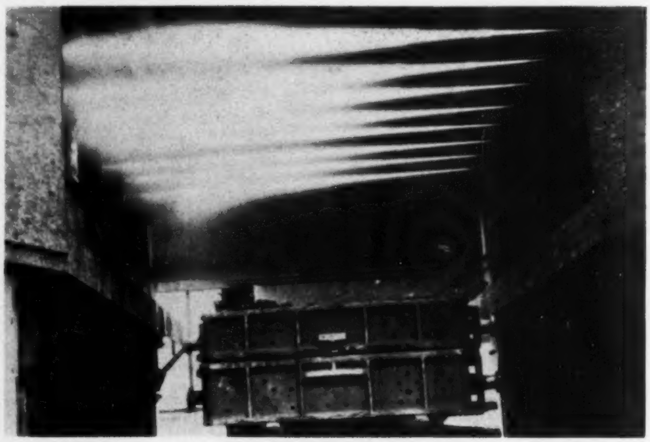
Chief advantages of the spectrographic unit are compactness, small space requirement, and reasonable cost. Components are standard and sensitivity and accuracy are the same as other standard spectrographic equipment. Routine analyses for several elements in one sample may be completed in about eight minutes. As with other spectrographic methods, wet chemical analysis is not completely eliminated.

High temperature is rapidly attained and total volume is kept unusually small in the high-frequency combustion unit for determining carbon and sulphur contents of iron and steel. As in the usual combustion methods, the sample is burned in a chamber in an oxygen atmosphere.

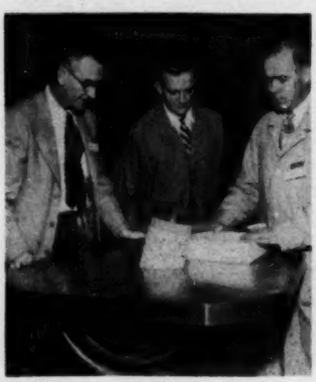
Health protection

New dust and fume control equipment offered to the foundry industry this year was not all shown in operating exhibits but pictures of actual installations have been included in the "What's New in Foundry Equipment" story. A new concept of a water curtain which employs water streams moving at about 30,000 fpm collects dust and fume down to about ½ micron in size. Experimental data from a foundry installation show that the equipment wets out and removes 95 per cent of the dust in the shakeout area, removing it as a disposable sludge. A crane operator can easily see the work and no splash occurs when chains and slings momentarily pass through the water streams.

A heavy duty unit for heavy industrial dust loadings has been developed. A wet type collector of pop-



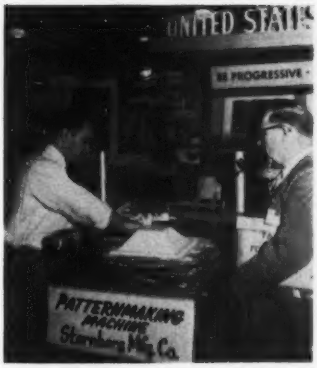
Water jets suck in dust particles down to ½ micron in size, possibly smaller, to keep air at shakeout free of dust and fume. Clean air is returned to foundry.



Tilting arbor oscillating spindle sander and grinder uses drums up to 12-in. dia.

Spindle sander and grinder for smaller sizes has vise for precision work.

Swedish visitors examine new molding machine at the Foundry Congress.



Ingenious machine simplifies production of solid or hollow plaster patterns.

New pattern plastic has high impact strength, superior dimensional stability.

ular design, the new unit has a sludge ejector of the same type as the lighter units in the series although paddle depth and shaft diameter have been increased to handle the heavier sludges.

One equipment manufacturer's new rotating blasting unit has a dust tight door which controls the dust hazard, eliminates abrasive spillage, and reduces noise.

In a display combining a full sized, cutaway bag house and an animated flow diagram, another company showed how a West Coast installation controls cupola dust and fume to meet local air pollution requirements. The installation includes a closed top cupola, a primary and secondary cooler with spray nozzles and precise temperature regulation, and a baghouse containing synthetic fiber bags. There is no evidence of condensation in the bag house.

Patternmaking

New ideas, materials, and equipment are constantly arising to aid the patternmaker meet new demands on his skill, ingenuity, and accuracy. Need for periodic replacement of high precision pattern equipment has led to the recasting of high production metal patterns in metal molds. Latest demand—which is increasing the need for more skilled metal patternmakers—is in the shell molding field where precise metal patterns are used exclusively.

New patternmaking materials exhibited at the International Foundry

Spectrographic unit is complete, compact laboratory for foundry analyses.

Congress included controlled-expansion plasters and a plastic. By controlling the water added to the plaster, the material can be made to expand to any desired degree from 1/16 to 1/4 in. per foot. Uses include production of master patterns and core boxes from patterns made to standard shrinkages, and manufacture of core drier patterns.

The plastic material on display for the first time was developed to overcome the low impact strength and dimensional instability of the phenolic resins that are commonly used.

Patternmaking equipment shown indicated a distinct trend toward use of better materials, bearings, shafting, and closer tolerances. New equipment typical of the trend were the spindle sanders and grinders exhibited by two different manufacturers. Both machines are precision tools with tilting arbors but cover two completely different ranges of spindle diameters.

Another machine exhibited was developed by a user of plaster to facilitate accurate production of hollow and solid shapes.

▶ *Issue revised copper-base and new gating publications*

▪ Two new A.F.S. publications became available to the foundry industry in June. Both were displayed in pre-publication form at the International Foundry Congress and many were ordered for delivery as soon as received from the bindery.

The books are SYMPOSIUM ON PRINCIPLES OF GATING ($4.00 members; $5.75 non-members) and COPPER-BASE ALLOYS FOUNDRY PRACTICES ($3.75, members; $5.75, non-members).

The Symposium is made up of the talks presented at the popular all-day gating symposium held during the 1951 Convention. Theory and practical applications of gates in the casting of basic types of alloys are covered in the book, which is a cloth bound, 100-page, 8 1/4 x 11 1/4 in. publication.

COPPER BASE ALLOYS FOUNDRY PRACTICES is a thorough revision and expansion of a section of RECOMMENDED PRACTICES FOR SAND CASTING NON-FERROUS ALLOYS. Enlarged from 98 to 232 pages, the new book contains all the previously published material, brought up to date, plus chapters on melting and pouring practices and equipment, test procedures for quality control, permanent mold casting, die casting, centrifugal casting, plaster casting, insulating pads and riser sleeves, inspection, salvage, metallography.

The chapter on metallography is one of the outstanding additions to the new volume, containing 41 photomicrographs with extended captions. Other chapters deal with practices recommended for the casting of various types of copper-base alloys, causes and remedies of defects, conforming specifications, and specific applications. The chapter on applications contains more than 250 specific uses of copper-base alloys.

SYMPOSIUM ON PRINCIPLES OF GATING and COPPER-BASE ALLOYS FOUNDRY PRACTICES are available from the American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5. Postage is prepaid if remittance accompanies order.

Save by briquetting borings

■ By briquetting 350 tons monthly of gray iron and malleable borings and turnings produced in its machine shops, Stockham Valves & Fittings, Inc., Birmingham, Ala., is benefitting from a source of good scrap of known composition with low sulphur and phosphorus, and is saving money. Direct conversion cost of the borings is $2 per ton. Sold for use in blast furnaces, the borings bring only $21 a ton while the scrap and pig required to replace them in Stockham furnaces runs $45 to $60 a ton. Cost of the entire installation including floor, all equipment and building, was $55,000. The briquetting press was purchased, the rest of the facilities were designed and erected by Stockham personnel.

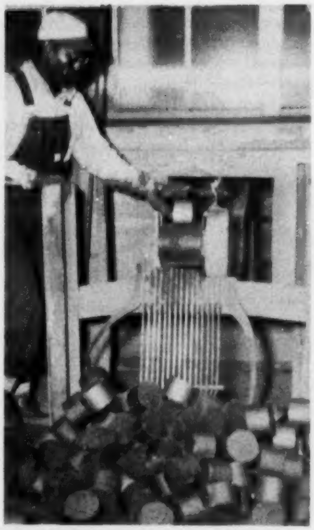
Four basic components

The description of this metal and dollar saving installation is based on an interview with F. E. Vann, plant engineer for Stockham. Photographs are by Jane Faulkner, editor of the company's *Bull Ladle*.

The briquetting installation consists essentially of a press, a drier, and two storage silos. Borings and turnings are brought to the briquetting unit by fork trucks with dump hoppers and stored in piles just outside the briquetting building. Fine water sprays play on the piles to wash out some of the coolants and cutting fluids.

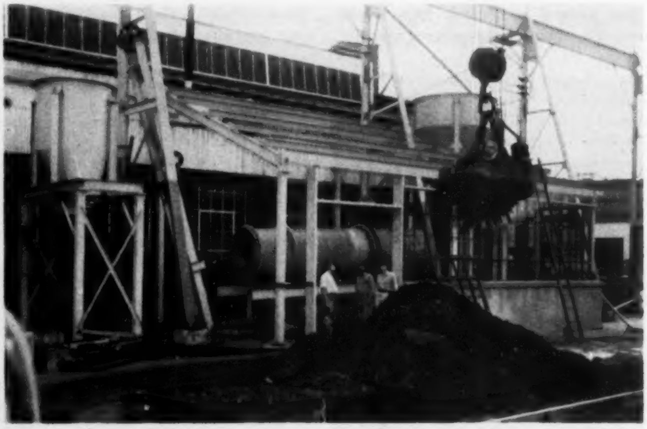
Heat removes oil

An overhead yard crane with magnet transfers the borings to a 12-ton cylindrical storage hopper which passes the borings by an electric vibrating feeder into the high end of the inclined drier. The drier is a drum, 20 ft long and 3 ft in diameter, which revolves at 6 rpm. Heat to remove additional cutting oil is supplied by a gas burner located at the lower end of the drum. Burner end of the drum is stainless steel. Forced draft in the drum is

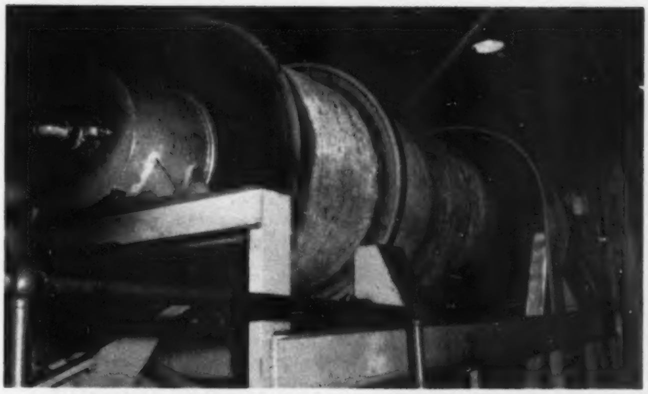


Briquettes weighing 11 lb, with 80 per cent density, are discharged from press at rate of one every 6 to 8 seconds.

Gray iron and malleable turnings from plant machine shops are trucked to pile outside briquetting building.



Briquetting installation under construction at Stockham Valves & Fittings, Inc., Birmingham, Ala. Drier in center receives borings from silo at right, discharges them into bucket elevator (not shown). Hopper at left feeds press.



Revolving steel drum (upper) heated by gas burner removes coolants and water from borings prior to briquetting.

Operator (lower) clears grizzly that keeps material over ⅜ in. from getting into briquetting press.

Bucket elevator catches discharge from drum drier at right, fills storage hopper located directly over press.

provided by a stack fan which exhausts into a cyclone.

Vanes in the drum lift the borings and drop them through the hot draft. To prevent borings from the entire length of the drum dropping simultaneously, the length was divided into three sections with the vanes in each section out of phase with the other sections.

Remove large material

At the exit end of the drier, a continuous, chain-type bucket elevator lifts the hot borings into a 6-ton cylindrical hopper with an electric vibrating feeder. Before entering the briquetting press, the turnings are screened by a ⅜-in. grizzly to separate large material which might damage the die. The material separated includes small parts and tools which pass down a chute into a salvage box.

Water and oil content of the borings as they enter the press is important. Too little lubricant will cause the briquet to freeze in the die. Too much results in the briquet exploding with a loud report when the plunger pressure is released. A briquet is formed every 6-8 seconds by hydraulic pressure of 2000 tons on the plunger. The briquets are cylinders 3 in. high and 4¼ in. in diameter. Weighing 11 lb, they have a density 80 per cent that of solid iron.

A typical 4000-lb charge in a Stockham gray iron cupola consists of 400 lb briquets, 1400 lb remelt, 200 lb steel, 1500 lb high phosphorus pig, and 500 lb low phosphorus pig. More than 10 per cent briquets in the charge results in a drop in carbon due to the presence of roughly 50 per cent of malleable borings in the briquets and to the loss of graphite flakes from the gray iron turnings during machining and handling.

The cupolas operate on a 12 to one coke ratio. Balanced blast, with only the two lower rows of tuyeres in use, the cupolas each turn out 25 tons an hour on an 8-hr pouring schedule. The tuyeres open and close automatically on a time cycle to enable them to be kept free of slag.

Departmental project

Several departments of Stockham Valves & Fittings participated in the development of the briquetting installation. The construction department erected the briquetting plant. The metallurgical department studied the metallurgical aspects of briquet use in the cupola. Designing and rounding up the equipment was the job of the engineering department. Glad to have the briquetting unit installed and in use is the purchasing department which now does not have to seek the metal salvaged each month.

A purchaser looks at the foundry

Standardizing casting practice

A. S. GROT / *Plant Metallurgist, Edward Valves, Inc., East Chicago, Ind.*
L. H. CARR / *Dir. of Eng. & Res., Edward Valves, Inc., East Chicago, Ind.*

Many discussions of foundry difficulties have ended with a plea for closer cooperation between designers and foundrymen. This article discusses the successful control program of a company, which tried many ways of implementing cooperation and found it not a simple job.

■ Edward Valves, Inc., manufactures steel valves intended primarily for high pressure service throughout a wide temperature range. The valve body castings vary widely in size and shape. Internal pressures range as high as 10,000 psi, with service temperatures from minus 300 to plus 1600 F. This range of service, of course, calls for quite a variety of steel compositions as well as design shapes. Valve body castings for these services are purchased from the best available steel jobbing foundries in the Midwest.

These foundries have a remarkably uniform practice in the production of steel from heat to heat. They also produce very uniform steel from one foundry to another, within the chemical and physical ranges given in various ASTM specifications. Test bars from one foundry, for all intents and purposes, are duplicates of those from any other foundry.

On the other hand, the actual valve castings exhibit no such uniformity. In fact, the same part poured in the same foundry at different times fails to show the desired uniformity in soundness. Figure 1 shows typical cross sections of types of defects which make trouble in the manufacture of cast steel valves.

Fig. 1 . . . Such defects as these may make castings useless to the purchaser.

For years we have followed a policy of endeavoring to cooperate with foundries toward eliminating such defects. At the time of casting design, we call in foundry representatives in order to try to secure that measure of cooperation which is so highly recommended in obtaining a satisfactory product. We further follow up this initial conference with regular reports to the foundries as to defects uncovered in manufacture.

Through the years these reports took a variety of forms, but in general they consisted of drawings or keyed tabulations showing the casting pattern number, heat number, type and location of defect, and hours of welding time required for repair. By means of these sheets we felt we were making available to the foundrymen a running record which would make possible correction and subsequent improvement. The records, of course, were supplemented by frequent personal conferences to point out defects or discuss methods of correction.

This method did not solve the casting soundness problem; further constructive steps had to be taken. Research disclosed that three of the foundries were marketing their own pressure-containing products for special services. Four were supplying other makers of valves and related fittings with pressure castings. There seemed to be no lack of technical knowledge in relation to the problem of pressure-containing valve bodies. All of these foundries

seemed to be adequately staffed with trained and experienced supervisors and to have a wide background in high quality castings for high pressure work. However, the study showed that there was a lack of agreement on how to obtain a sound casting. Each foundry seemed to have slightly different methods of heading and gating, and even used different methods at different times.

Why no standard?

This lack of standardization can not be entirely attributed to the foundries themselves. The high pressure steel valve business is, of necessity, a relatively special one in which the production runs are short and the types and varieties of castings many. Pattern equipment therefore must be flexible so that it can frequently be altered. Such alteration tends to upset and discourage careful planning. A proven system of gating and risering may be broken up so that only elaborate bookkeeping and careful records will insure a return to this set-up when the pattern is returned to its original mounting. A second disruption of gating and risering is caused by the movement of pattern equipment from one foundry to another. This has long been recognized as a practice to be avoided, but reasons often arise which make it necessary.

Our study showed that the principal defect is shrinkage, which causes about 60 per cent of all casting repairs. Sand inclusions, hot tears, and cracks constitute the other major sources of difficulty. Individual foundries have many ideas on how to correct these shrinkage cavities. Several years ago one of the favorite methods was to apply larger and larger heads in an effort to feed the castings. Samples of this are shown in Fig. 2. The lack of success of such methods is indicated by the typical repair areas shown in Fig. 3.

Directional solidification

Internal chilling, external chilling, padding, selected pouring temperatures, and other methods of obtaining directional solidification have been tried. Early efforts toward built-in directional solidification encountered several difficulties. In some cases, metal additions designed to facilitate the gating and risering methods of one foundry would be misinterpreted in a second as an integral part of the casting requiring

Fig. 2 and 3 . . . Large feeding heads are a favorite way of correcting shrinkage cavities, but their lack of success is shown by these typical repair areas.

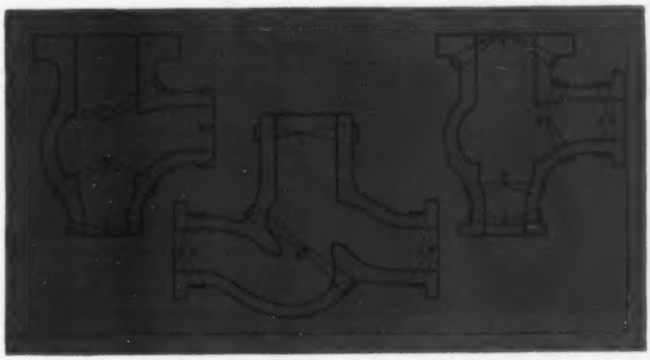


Fig. 4 . . . For fixing the location of casting defects, various sections of a valve body are designated by area numbers. This permits recording on a card.

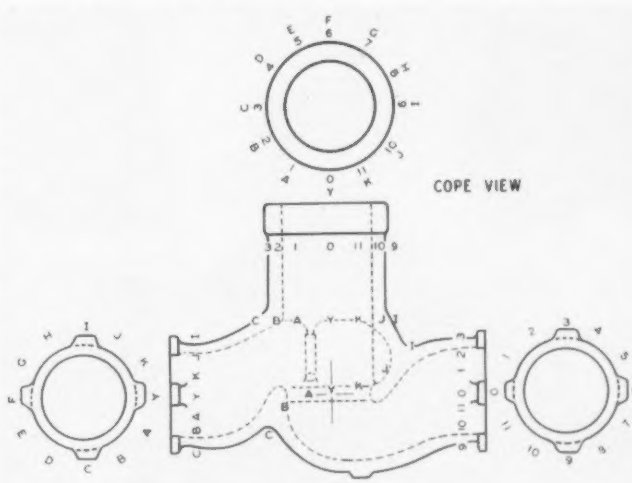


Fig. 5 . . . These designations further subdivide the areas of a valve body.

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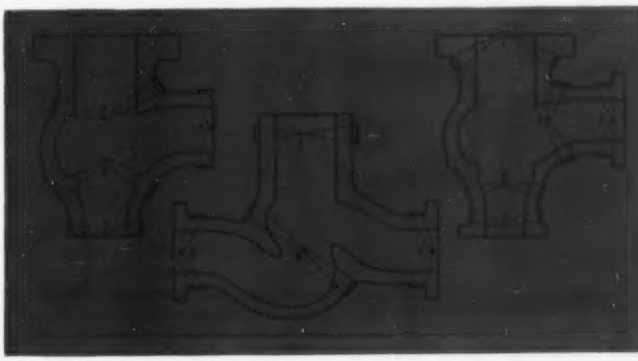


Fig. 4 . . . For fixing the location of casting defects, various sections of a valve body are designated by area numbers. This permits recording on a card.

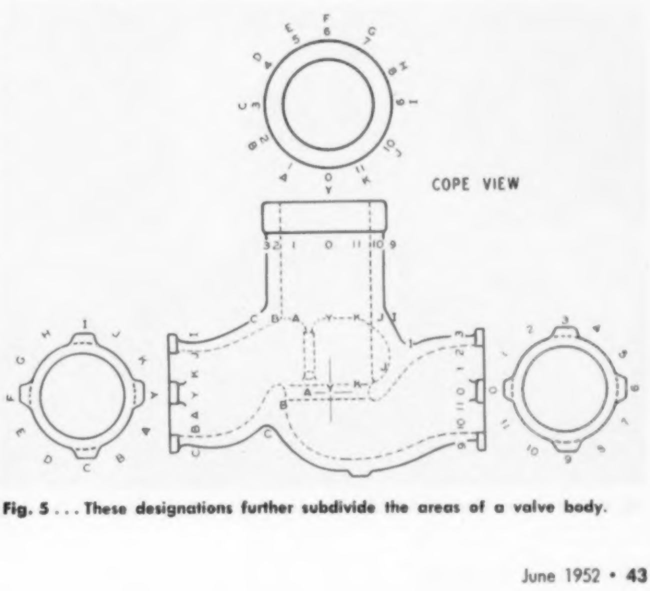


Fig. 5 . . . These designations further subdivide the areas of a valve body.

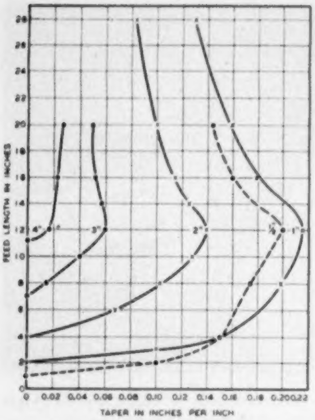


Fig. 6 . . . Curves on the padding required to induce soundness by directional solidification. (Duma & Brinson)

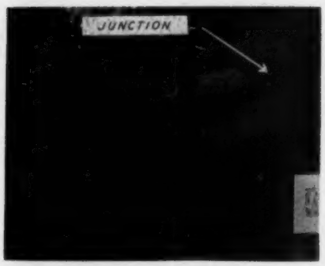


Fig. 7 . . . Pad on parting line gives directional solidification there, but not at body wall-diaphragm junction.

special treatment. In a few cases we even found these additional pads misinterpreted by the same foundry at some later date.

Consideration of the general matter of soundness leads to the conclusion that there is no lack of methods or ideas for developing sound castings. The great lack is in the coordination of all the data available and the careful following up of the conclusions to be drawn. Individual foundrymen are experts on too many different subjects to give proper time and attention to isolated valve castings. Our report sheets to them contained too much miscellaneous information.

What was lacking was a practical starting point with individual castings. There was also a lack of appreciation for the uniformity of the problem. We had designed what was felt to be a uniform line of valve body castings which varied but little from size to size and from pressure class to pressure class. However, these were distributed throughout a number of steel foundries, and individual foundrymen failed to see this uniformity.

A new approach

Based on these experiences and studies, a new and more realistic approach was initiated. It was decided to present the foundrymen with specific material with which to solve the problem.

The first step consisted of properly recording the defects. This record was set up on the basis of radiographic inspection, magnetic particle inspection, visual examination after rough machining, and hydrostatic test procedure. Defects were subjected to a standardized classification following that in the ASTM Standard E71 covering the radiography of steel castings. These standards group seven types of defects into six grades of increasing severity. They are designated Class 1 for the mildest defects up through Class 6 for the most severe. Types of defects are listed as gas and blow holes; sand spots and inclusions; internal shrinkage; hot tears; cracks; unfused chaplets; and internal chills. All defects are graded to these standards and are in turn described by corresponding class and severity indices.

Valve areas

For fixing the location of the defects, various sections of a valve body are designated by area numbers as shown in Fig. 4. Figure 5 shows the method of further subdividing these areas. Thus numbers and letters in a standardized method serve to describe and locate the defects enough for recording on a card. Such cards describe quality in terms of exact casting, foundry supplier, radiographic work done, nature and extent of defects, and repairs made.

Actual repairs are reported by the repair welder. A typical form contains a printed drawing of a valve casting on which the welder indi-

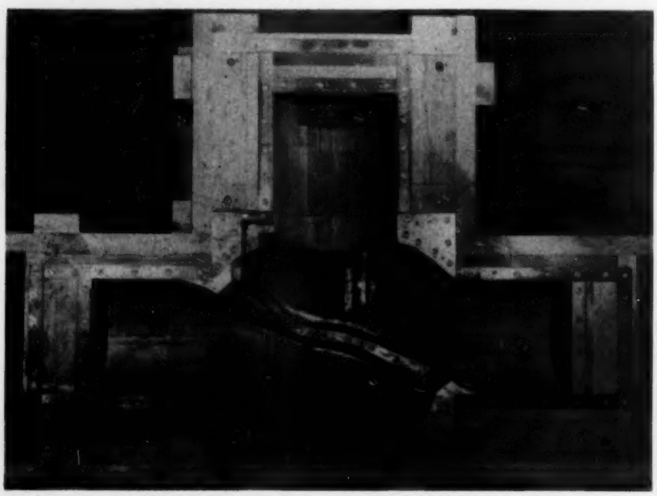


Fig. 8 . . . Core box was constructed to produce body wall-diaphragm soundness.

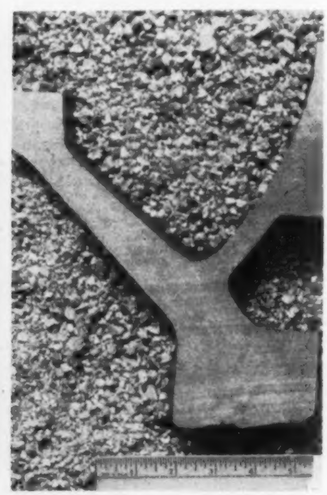


Fig. 9 . . . Changes brought soundness.

cates location and depth of the defects as well as repair time expended.

A third index available for the study of casting soundness is the rework record of the accounting department. All repair is done under individual job time tickets. Compilation of repair costs is available as desired, either by individual foundries or by individual castings.

In practice it is more productive to compile the repair data from all sources against individual parts. Similar parts which differ only in size and pressure class can now be compared. If necessary, various foundry sources can be compared on the basis of the same or similar work. A careful study of such accumulated data allows the selection of good practices from bad and the separation of necessary features from unnecessary. It is a reservoir of immediately available data on a large number of different variables for geometrically similar castings. This has made it possible to progressively and yet rapidly run through several different styles of heading and gating. As mentioned before, the problem never seems to be one of finding enough new methods to try. On the contrary, it seems to be the one of settling down to the method which most uniformly produces high quality work.

Directional solidification

Continued changes and trials indicated that in general, directional solidification built into the valve body would give best results. This, however, calls for close check on the position of heads and gates so that the small amount of extra material added by the valve designer will be correctly used. This tapering of sections is supplemented by external chilling, with the aim of always using the minimum amount of risers and removable padding. Internal chilling is not generally dependable.

Figure 6 shows a series of curves on the padding required to induce soundness by directional solidification as determined by J. A. Duma and W. S. Brinson ("Application of Controlled Directional Solidification to Large Steel Castings," A.F.S. TRANSACTIONS, Vol. 48, pp. 225-282 [1940]). These are not directly applicable to valve design. Because of hindered heat extraction on the core side and the re-entrant angles on the wall of the valve body, the padding required varies from the curves depending on the size and shape of the valve body. The relative values between sections, however, are applicable. Having determined by trial the padding required for one wall thickness at a given size and shape, the correct padding for other classes of valve bodies of the same size and shape is directly determined from the relation for section thickness and length of feed.

The methods of applying padding to an existing diaphragm type of globe valve body are relatively simple. Figure 7 shows the application of a simple ridge-like pad along the parting line. This imparts directional solidification at the parting line. However, it does not give directional solidification at the junction of the valve diaphragm and the body wall. Figure 8 shows a new core box built to produce this latter directional solidification. Note the wedged progression resulting at the body wall. Figure 9 shows an acid-etched section of the outlet end from an 8-in. 300 lb globe valve body showing the results of casting soundness after these changes have been made.

The internal contour of the modern valve is usually fixed. It has been accurately engineered for flow characteristics of high volume and minimum pressure loss. One of the early steps in designing such valves is to make up a sectional skeleton framework representing the cross-sections of the valve. Figure 10 shows a series of these templates mounted and spaced to describe the interior and exterior surfaces of the valve. Each section is available for individual and progressive study and modification as dictated by potential casting soundness requirements.

Directional solidification is mapped and built into the design at this point. The corrected model serves as a pattern drawing detail and is used in the valve pattern construction. With the pattern completed, the ability to reproduce the intended design shape is checked by pouring a plaster body cast under standard foundry conditions using sand molds and cores made in regular production schedules. Figure 11 shows a

Fig. 10 . . . Early design step is making templates of inner and outer surfaces.

Fig. 11 . . . Half-section plaster cast.

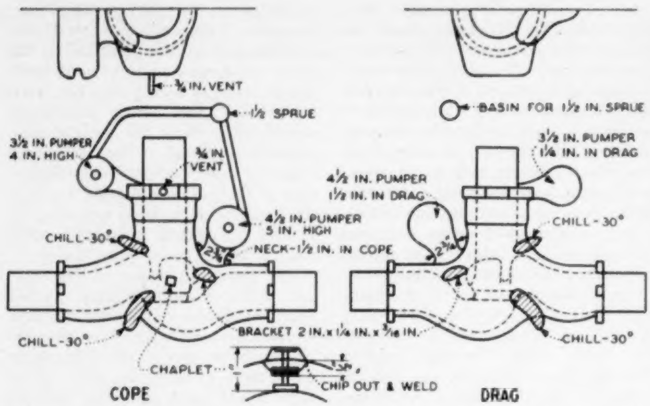


Fig. 12 . . . This detail is usually supplied when placing an order for a sample casting. It represents a first guess at the best method of gating and heading.

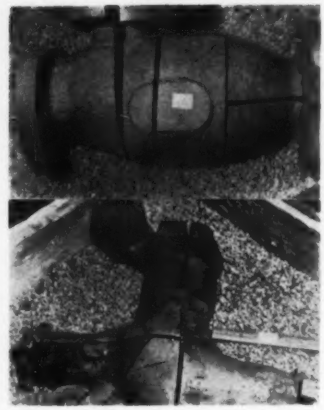


Fig. 13 . . . Sample casting is first radiographed, then sectioned as shown.

typical plaster-cast globe valve body cast in half-sections. The plaster cast is readily sawed along mapped solidification routes, and the casting shape is checked. The check for soundness is indicated by the cross-section's increasing as it approaches the feeding points. There is no shrinkage of plaster to indicate actual points of unsoundness.

Any revision is readily made on the plaster cast, and the corrected cast is used as a tangible guide for drawing and pattern alterations. With pattern equipment capable of reproducing the designed valve body, an order is placed for a sample casting. The order is accompanied by a calculated standard method of gating applicable to the valve body. Figure 12 shows the detail normally supplied. This represents a first guess at the best method of heading and gating the particular casting.

As mentioned previously, the gating and risering charts are drawn up on the basis of past experience with similar valve castings and represent the best combined knowledge of the various specialists in all foundries available. The first sample castings from these new patterns are then inspected by the usual methods, using radiography and magnaflux, and finally are sectioned and deep-etched in order to positively study the soundness. Typical sectioning is shown in Fig. 13. An examination of the risers, of course, is important to indicate whether the most efficient use has been made of the available metal.

The steps in planning and development of a typical casting are not unique. They merely represent the logical method of arriving at a system of pouring a particular casting. The fact which we feel is quite important, however, is our interest as a purchaser that the final standard planning be used by all foundry suppliers. In the course of developing a heading and gating practice, we worked through all the variations shown in Fig. 14 for angle valves. Each of these represented the serious best judgment of a qualified foundryman as to a method of obtaining soundness in a particular casting.

It must be obvious that casting purchasers could be greatly confused during the course of design and manufacture if they were to receive castings made in this wide variety of methods. By following a course of trial and error coupled with inspection and recording, we have arrived at the heading and gating method shown in the lower right-hand corner of Fig. 14. This seems to represent the maximum foundry yield with the maximum soundness. This is of benefit to our suppliers as well as to us.

With basic information of this sort, our valve designers can start right in on a new type of valve, knowing where to place the heaviest sections. Inspectors can check the incoming castings with great confidence, knowing that the castings will tend to have a repetitive nature irrespective of size, pressure class, or foundry source. Analysis of service problems (if and when they occur) is facilitated by a confident knowledge of the heading and gating methods used for the castings.

Standardized risering on flanged end valve bodies is shown in Fig. 15. The internal seat diaphragm has been tapered to feed from the three risers on the three flanges. Note the simplicity in set-up. All risers are at the parting and on flat, readily accessible surfaces. Additional simplification is possible by combining two risers into one and feeding two adjacent flanges with a "Y" contact.

Although the simplest risering on welding-end, pressure-sealed globe valves is a single riser into the body, this is not always possible. Figure 16 shows cope and drag views of such a valve body with a ring retainer at the bonnet end. The basic body is modified by a heavy ring addition which requires a separate riser similar to flanged end construction. The welding ends of these valves because of their reduced wall thickness, shape, and high degree of soundness requirement are best made by feeding through the basic body casting. Figure 17 shows typical cope and drag views of a welding-end, pressure-sealed angle valve body.

Comparison of previously accepted methods and present standard practice may be of interest. Figure 18 shows the before and after planning of a plug type valve body. Note that it has been inverted to avoid sand spots on the machined taper plug bore and cover end.

It is evident that the standardization of planning has resulted in an increase of yield for the foundries and a decrease in repair and cleaning cost both in the foundry and in the valve manufacturing plant. Tabulations of foundry yield, comparing the older methods with the present standard method, show that

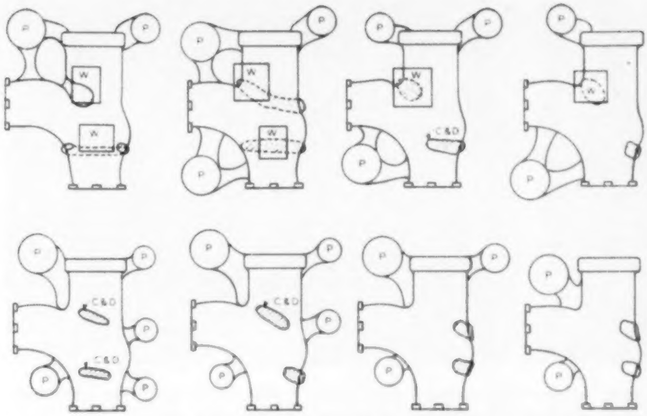


Fig. 14 (above) . . . All these steps were worked through in the course of developing the best heading and gating practice to use on angle valves. Each of these methods represents the considered judgement of a qualified foundryman on how to obtain casting soundness on this particular job. Final solution is shown in the lower right-hand corner. C & D stands for cope and drag; P represents a pumper, or pressure, riser; W is used to mean an open, knock-off riser.

Fig. 15 (above right) . . . Here is the standardized risering on flanged end valve bodies. Internal seat diaphragm has been tapered to feed from the three risers. All risers are at the parting, on flat, readily accessible surfaces. As simple as this set-up is, further simplification is possible by combining two risers into one and feeding two adjacent flanges with a Y contact.

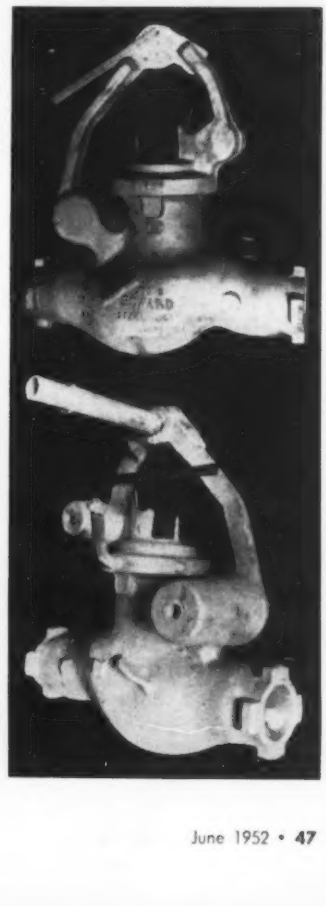
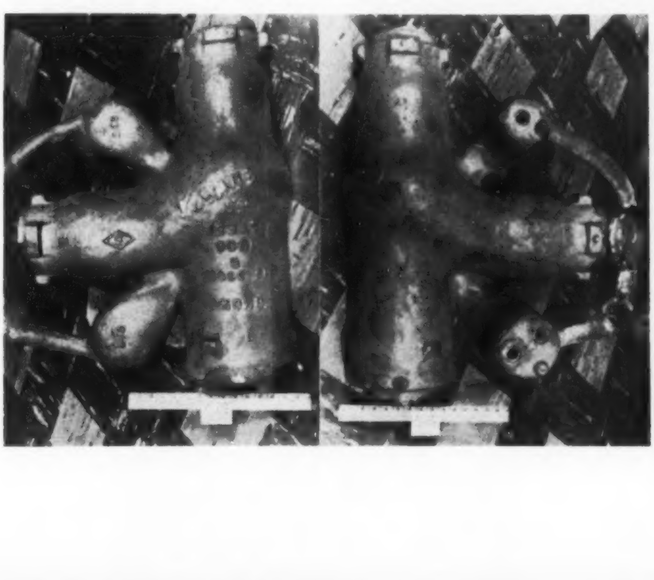


Fig. 16 (below right) . . . Cope and drag views of a welding-end, pressure-sealed globe valve body with a ring retainer at the bonnet end. Simplest risering is a single riser into the body, but modification of the basic design by the heavy ring required a separate riser similar to that used on flanged end valves.

Fig. 17 (below) . . . Cope and drag views of a standard welding-end, pressure-sealed angle valve body shows the usual way to feed. Because of the reduced wall thickness, shape, and high degree of soundness required in the welding ends, these valves are best made by feeding through the body of the casting.



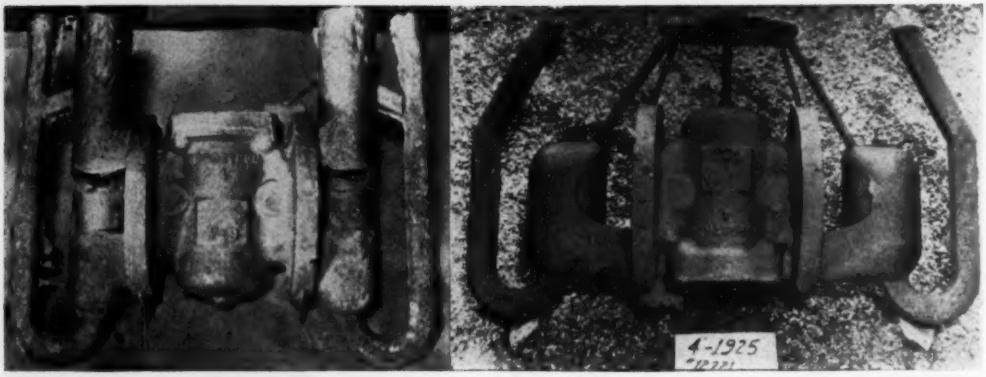


Fig. 18 . . . Before (left) and after (right) shots showing the results of standardized practice for a plug type valve body. Notice that body was inverted to avoid sand spots on the machined taper plug bore and cover end.

yields have been increased from the previous 45 to 50 per cent to the present 65 to 70 per cent.

The reduction of repair costs in valve making is not simple to depict. Reduced costs are continually offset by increasing quality requirements. Not too long ago only hydrostatic unsoundness and defects disclosed on machining were subject to repair. The introduction of magnetic particle inspection and radiographic examination has increased the amount of repair work required for a given quality of initial castings. At present there is a trend toward gradually decreasing the permissible defects in castings.

However, the standardized method of heading and gating has greatly reduced the repair time where adopted. Some of this gain has been due to the redesign of valve bodies, a redesign in part dictated by what has been learned in the careful follow-up of foundry practice. The procedure described has saved many thousands of dollars for ourselves as valve manufacturers and for our foundry suppliers.

▶ "Corn Land" becomes 41st chapter

▪ The 41st chapter in the A.F.S. family was officially christened the "Corn Land Chapter" at a meeting held at the Castle Hotel, Omaha, May 26. A petition for chapter status, signed by 67 foundrymen representing 16 companies in Nebraska and Iowa, had been previously approved by the A.F.S. Board of Directors on May 4.

Earl White, Paxton-Mitchell Co., Omaha, was elected chapter chairman at the May 26 meeting; I. M. Johnson, Griffin Wheel Co., Council Bluffs, Iowa, vice-chairman; John C. Henderson, Omaha Steel Works, Omaha, secretary; and Bert J. Baines, Omaha Steel Works, treasurer.

Chapter directors are: 3-year terms—D. J. Miller, United Brass Foundry, Omaha; O. V. Hitchins, Cushman Motor Works, Lincoln; 2-year terms—Warren E. Oehrle, Oehrle & Bergman Pattern Shop, Omaha; Joe Elliott, Western Land Roller Co., Hastings; 1-year terms—J. M. Buckholz, Dempster Mill Mfg. Co., Beatrice; J. M. Bruer, Paxton-Mitchell Co., Omaha.

It is expected that the new "baby" chapter will be installed at the first

regular meeting in the fall. The new group should give foundrymen within an area of 150 miles from Omaha and Lincoln an opportunity to meet and exchange ideas. Hitherto, nearest chapters have been Mo-Kan at Kansas City, Mo., Timberline at Denver, and Quad City at Davenport, Iowa.

Other members of this latest chapter include:

Charles T. Vaughan Co., Omaha: Charles T. Vaughn.

Northwestern Metal Co., Lincoln: Robert Cohen.

Dempster Mill Mfg. Co., Omaha: Harry M. Engler, Joe M. Buckholz, and Ralph E. Heikes.

United Brass Foundry, Omaha: David J. Miller, Sr., David J. Miller, Jr., Wallace McCarrel, Otto Odorisio, William F. Miller.

Oehrle & Bergman Pattern Shop, Omaha: George P. Herman, Warren E. Oehrle.

Cushman Motor Works, Inc., Lincoln: Walter J. Mitchell, James A. McGregor, Henry Eichler, Charles L. Burchens, Owen S. Hitchins.

Paxton-Mitchell Co., Omaha: Earl White, Roger C. Wright, E. Clayton Ward, Frank W. Arnoldus, J. M. Bruer, Willard Ballou, Joseph J. Cepuran, Harold R. Hansen, A. W. Gebhardt, Vern Holmes, Frank Kleffman, Joseph A. Kobie, Paul Melcher, Earl W. McCoy, G. Moluf, Paul Netzel, H. E. Norman, William S. Peach, Walter Salmen, Robert A. Steiber, Ira Trachtenburg, Frank E. White, L. E. White, Tony Zuccardi.

Omaha Steel Works: Bert J. Baines, J. C. Henderson, Victor C. Munteau, Otis A. Bundy, Arnold E. Keithley, Joseph Cottone, Austin L. Anderson, Rex V. Phinney, R. M. McCullough and Harold E. Moore.

Western Land Roller Co.: Charles Anderson and Joe Elliott.

Firms holding company memberships are Cushman Motor Works, Dempster Mill Mfg. Co., Northwestern Metal Co., Oehrle & Bergman, Omaha Steel Works, United Brass Foundry, Western Land Roller Co.

Lighting the standard cupola without causing smoke

C. F. SEMRAU / *Metallurgist, Illinois Malleable Iron Co., Chicago*

Better use of existing facilities and improvement of melting processes is one of the approaches to reducing air pollution adopted by foundrymen members of the Cleaner Air Committee of the Chicago Association of Commerce and Industry. The procedure for elimination of smoke during cupola light-up described here was so well thought of by Cleaner Air workers that descriptions and drawings were distributed to over 1000 plants in the Chicago area.

■ Use of a cast-iron grate and a gas burner in lighting up a cupola will reduce air pollution to a great extent. These devices have been used in the author's foundry for over 10 years with conspicuous success.

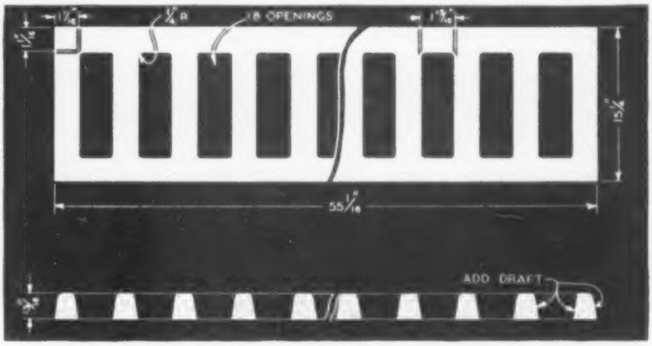
Initial step in setting up the cupola for firing is to cover the rammed-in sand bottom with wrapping paper or old newspapers. Tar paper, which produces black smoke, should never be used. One or more boards, the area of the grate, are then laid in line with the burner opening. These serve as a foundation for successive layers of coke.

Two parallel rows of carefully selected coke 10 in. high are then laid, leaving a tunnel 12 in. wide directly in line with the burner opening. Grate rests solidly on these two rows of coke. Cupola is then filled to tuyere level, adding balance of bed coke as needed.

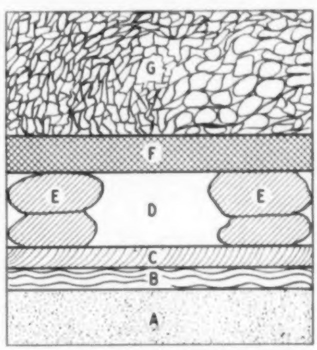
Plate seals opening

Burner opening through the cupola shell and lining is about 6 in. square. The bottom of this opening is level with the sand bottom at point of entry. After bed is burned in, the opening is closed by ramming in a mixture of fireclay and grog. A steel plate is fitted into a slot outside the steel shell to completely close the opening and prevent leaks.

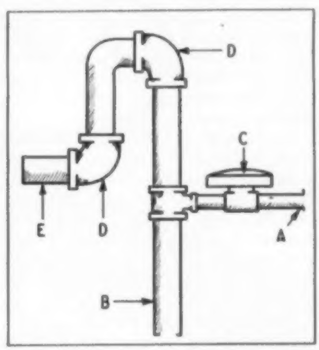
Air for the burner is supplied by a centrifugal blower, 970 cfm at 1 psi pressure. It feeds through a 3-in. pipe. Gas feeds through a 1½-in. pipe into the air pipe. It mixes with the air and is ignited in a burner mounted in the opening of the air pipe. The nozzle unit must be flexible so that it can be moved aside while the hole is being rammed shut.



Cupola light-up grate. Length depends on the size of the cupola; it is generally better to make it too large than too small. Grate is cast in open floor molds from a normal heat, and will not affect final melt composition.



Light-up tunnel. A, sand bottom; B, paper; C, boards; D, 12-in. tunnel; E, rows of coke; F, grate; G, bed coke.



Cupola burner. A, 1½-in. gas line; B, 3-in. air line; C, air-gas mixer; D, flexible joints; E, burner nozzle inside pipe.

Length of time gas flame is left on depends on demand. With proper combustion, the iron grate will melt out in about 20 minutes. Gas can be turned off then, although air may be left on if desired. Since the grate is cast from a normal heat, and since its mass is small compared to the heat being run, it will not affect final composition.

Using the procedure and equipment described, it is impossible to tell when the cupola is being fired by watching for smoke.

A.F.S. to begin Fund solicitation for *Ten-Year S & H & AP program*

■American Foundrymen's Society will shortly take over active solicitation of funds for the 10-year, industry-sponsored Safety & Hygiene & Air Pollution Program started earlier this year. Originally, the National Castings Council agreed that each of its member organizations would solicit its membership for funds to start the program and that A.F.S. would take over both solicitation and operation of the program. As a result of the work of the NCC organizations, the program is off to a fine start, with upwards of $30,000 contributed only a few months after inception of the 10-year program. A.F.S. will now undertake to raise the balance of the $350,000 needed.

At the Annual Meeting of the National Castings Council, held during the recent International Foundry Congress, the Council pledged the continued support of its member organizations in making the foundry a better place to work by means of the S & H & AP Program.

Although raising of funds has been more or less at a standstill for the last two months because of the International Foundry Congress, the program has made great progress during the period.

Last month, A.F.S. appointed William N. Davis of Chicago, formerly a senior engineer with the National Safety Council and an expert in metalworking industry safety and hygiene practices, to head the Safety & Hygiene & Air Pollution Program. Mr. Davis is a permanent member of the A.F.S. Staff.

Working closely with Mr. Davis, industry committees have formulated, or are in the process of formulating, new S & H & AP codes for the foundry industry.

Three Safety & Hygiene & Air Pollution sessions, held for the first time at the International Foundry Congress, attracted widespread interest on the part of foundrymen from all over the country.

The first of these, held on May 3, featured talks on *"Ventilation at Non-Ferrous Melting and Pouring Operations,"* by H. J. Weber, American Brake Shoe Co., Chicago, and *"How to Maintain Foundry Ventilation and Dust Collecting Systems,"* by Kenneth M. Smith, Caterpillar Tractor Co., Peoria, Ill.

Second S & H & AP session, at 10:00 a.m., May 5, began with an outline of plans for the 10-year program given by James R. Allan, International Harvester Co., Chicago, chairman, A.F.S. Safety & Hygiene & Air Pollution Committee.

In the same session, N. H. Keyser and H. P. Munger of Battelle Memorial Institute gave their views on how *"The Foundryman Looks at Air Pollution,"* and Dr. D. A. Irwin of Aluminum Co. of America outlined *"Health Problems of the Metal Castings Industry."*

Third and final S & H & AP session, at 2:00 p.m., May 5, featured two talks—*"The Single Objective Approach to Foundry Safety,"* by Dan Farrell, U. S. Steel Co., Pittsburgh, and *"Air Pollution and the Cupola,"* by J. Radcliffe, Ford Motor Co., Dearborn, Mich.

Other recent activities of the A.F.S. Safety & Hygiene & Air Pollution program have included co-sponsorship of a Foundry Health Conference, held at the University of Michigan April 11 and 12. Papers presented at the Conference are scheduled to appear in AMERICAN FOUNDRYMAN in the near future and will shortly afterwards be published in book form by the Society.

Program objectives

Begun last year at the request of foundries throughout the country, the 10-year Safety & Hygiene & Air Pollution Program is being carried out by A.F.S. with the overall objective of aiding foundries to develop their own standards of working conditions. This is being done in several ways—dissemination of data, revision of existing codes of practices, compilation of a reference library, limited research, and sponsorship of seminars and conferences.

To accomplish the objectives of this long-range program, a minimum fund of $350,000 is being raised entirely by voluntary subscriptions from foundries. Contributions are solicited on a basis of casting-tonnage-per-foundry.

Thus every foundry in the United States has a stake in a brighter future for the metal castings industry.

S & H & AP Contributors May 1 to 31, 1952

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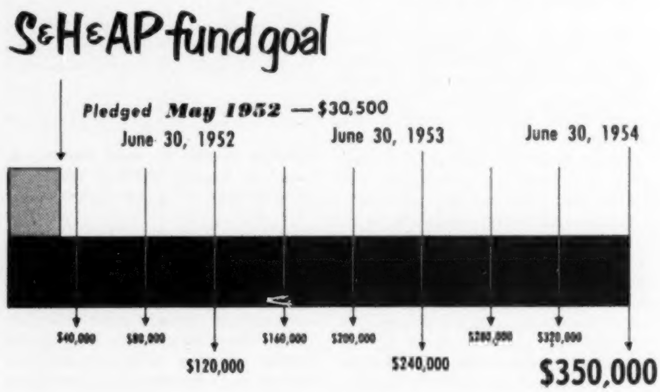
General Malleable Corporation, Waukesha, Wis.
Pohlman Foundry Co., Inc., Buffalo.



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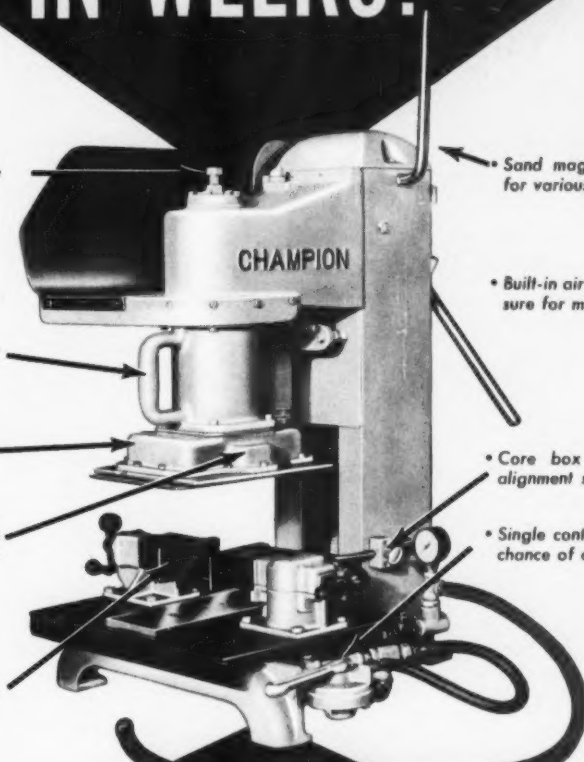

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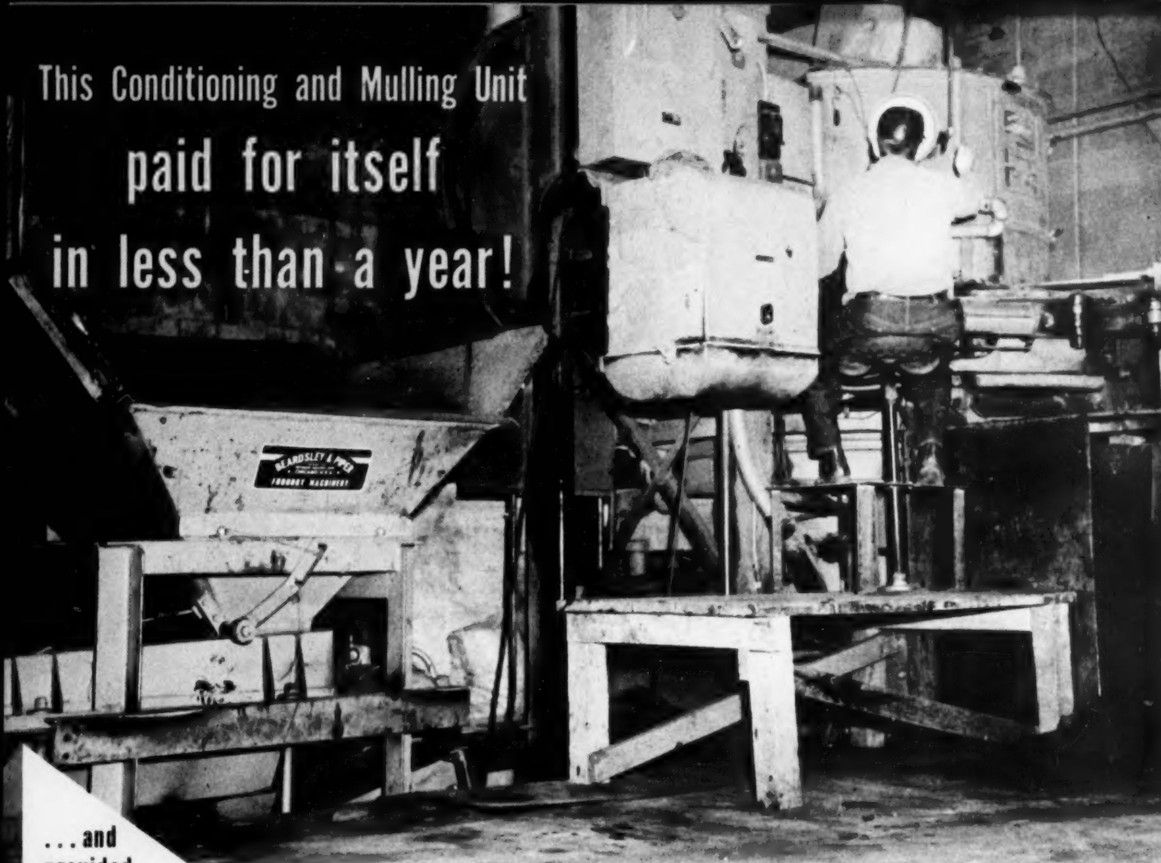

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Why doesn't somebody make a long, thin ingot?

The average brass and bronze ingot made today does not have the most efficient area-to-mass ratio for heat transference. In this article the author presents his views on a different shape that in actual tests has reduced melting time by an average of 14 minutes per heat, with a proportionate savings in fuel and labor cost.

L. M. LONG / *Consulting Engineer, Toledo, Ohio*

■ Time and again, supervisors are called in by management to explain the ever-increasing cost of fuel. Generally the blame is laid to green help, inferior equipment, or circumstances that "just happen". The usual result is a rigid enforcement of melting schedules, accompanied by an investigation into newer equipment and a possible change of fuel—oil to gas, or gas to electricity, or something to anything else.

Very seldom does the nature of the metals being melted enter into the picture, except as a discussion of pigging or briquetting shop borings for salvage and re-use.

Short cut

But what happens on a Friday night when all molds have to be poured off for the week-end, and it is suddenly discovered that an extra heat will be needed? Does the operator load another regular charge of borings, gates, shop scrap, and ingot? On the contrary, he resorts to one of the tricks of the trade and rushes out a charge composed completely of gates and small shovellings. It melts much faster, saves time. It also saves fuel. This short cut is rarely mentioned to the front office, which has been known to suggest the deliberate production of more gates and risers when presented with this information.

It seems wise to consider the effect of shape and size of a piece of metal on the amount of fuel used to melt it. For purposes of illustration, consider the brass or bronze ingot. It is not the author's purpose to detract or take away any of the merits of this product, or discount the great strides that have been made in bringing this product to the high standard of acceptance it enjoys today.

Ingots vary in size and shape, depending on the manufacturer. Each has his own design. Shape and size, however, are primarily set to facilitate production. The average ingot, weighing from 20 to 25 lb, shows about 94 square inches of surface, or something less than four square inches per pound.

The amount of heat conducted through a mass varies directly as the conductivity, area, time, and temperature difference, and inversly as the thickness. The area of the average ingot in relation to its mass is not the most efficient ratio.

What then is an efficient ratio? Obviously, a thin wire or strip; but this would be impractical. Somewhere between the wire and the present ingot is a shape that is both efficient and practical—for example, a square, billet-shaped stick having the approximate dimensions of 1¾ by 1¾ by 20 in. long.

Such a billet weighs 20 lb and shows 148 square inches of surface, or close to 7½ square inches per pound. This would give a 90 per cent improvement in heat transference due to area. The one-in. thinner cross-section than the average ingot would produce an additional 30 per cent advantage in transference.

340 pounds more

There are about 3850 cubic inches in a 250-lb crucible. Charged in the usual helter-skelter fashion, about 400 lb of sta dard ingot can be introduced; this akes up 1250 inches and leaves 2606 cubic inches of voids distributed throughout the charge. On the other hand, about 740 lb of "sticks" can be introduced, occupying 2350 cubic inches and leaving only 1500 cubic inches of voids. These voids, however, are mostly around the outside of the charge, where radiation from the crucible walls can best be utilized. This factor gives an additional 30 per cent efficiency in heat conductivity.

Some mathematical genius could undoubtedly calculate just what performance could actually be expected, but the author preferred to use an emperical method and conduct test runs. Sixty-two heats were made in a stationary crucible furnace. Six hundred pounds of 85-5-5-5 ingot were alternately charged with 600 lb of sticks. Tests took over eight days, and the average time saved by using sticks instead of ingots was 11 minutes per heat.

Although it developed that sticks could be charged faster than ingots, charging time was not considered. The entire charge was made at one time with the sticks, whereas the operator was obliged to put some of the standard ingots in and then feed the rest as the metal melted down. This represented an added fuel saving, as the cycle was shortened and less heat lost from radiation.

Saving fuel is only one of the many advantages to be gained by using the stick shape—ease of handling, storing on pallets, and uniformity of size and weight are among them. It is, however, the major one, and one which will help ease what the author considers a very serious national problem.

The stick shape could probably be produced as economically as the present ingot. It would, of course, have to be cast on end, with the top cropped off to present a smooth machined surface on which could be stamped the identity and maker's trade mark. Lopping off the top would also settle for all time the varied opinions of smooth-top versus rough-top. Due to being cast on end, mold life would be considerably increased. Actual production details, however, the author gladly leaves to the potential producer.

Fool-proof sand works for wide range of castings

Here's a start toward developing a sand for a wide range of casting section. No claim is made or intended that this work is wholly original or is the final answer, but it is offered as a simple approach to a universal problem which has been successfully solved in some 30 shops. Article was adapted from an address given by the author before a meeting of the Cope & Drag Club.

J. S. SCHUMACHER / *Chief Engineer, The Hill & Griffith Co., Cincinnati*

■ Three years' development has produced a standard practice that yields a single-purpose sand for a wide range of casting section. It gives good finish and low scrap at a reasonable cost. This work has been checked by a number of foundrymen and other investigators, who have substantiated these findings. Today over 30 foundries follow these procedures, with marked improvement in casting quality and finish.

A 4-screen sand seems to be the key to the results obtained. As classified here, a "screen" is a sieve retaining 10.0 per cent or more of a fineness sample. A sieve retaining 7.0 to 9.9 per cent is referred to as a "half-screen."

Lake sands and bank sands, shown in Table 1, are suitable. By combining them in a ratio of 60 per cent lake sand to 40 per cent bank sand, the screen analysis shown in Table 2 is obtained. Meshes 50, 70, 100, and 140 each retain more than ten per cent of the combination, making it a true 4-screen sand.

Here's why

The reason for the improved finish, better casting contour, low scrap, and other desirable qualities is the change in physical properties of the sand. Flowability is much improved, producing higher, more uniform mold hardness with the same degree of ramming as had been previously used on other sands. Figure 1 shows sketches of cuts taken through the drag under the former practice and under the new practice. Flat surfaces were rammed to 90 mold hardness. Note the uniformity of mold hardness on vertical walls under the new practice. This uniformity has been found on draws up to 21 in. on vertical walls.

These sketches were made of molds that had been jolted and butted off. Regardless of the type of ram used, if the same force of ram is applied to a 4-screen sand as to a five, six, or natural sand, the mold will be much harder on both vertical walls and horizontal sections. Uniformity of hardness will also be greater.

In an effort to determine by laboratory tests the phenomena that produced the high flowability, an adaption was made from work described by W. H. Moore: "Flowability of Molding Sand," A.F.S. TRANSACTIONS, vol. 58, pp 650-660 (1950). In this paper is described a 1 to 10 ram test made using standard A.F.S. equipment, wherein sample 1 was made with one drop of the rammer, sample 2 with two drops of the rammer, etc.

Each sample was held within the limits of ± 1/32 in., as prescribed in A.F.S. testing standards. Permeability, green strength, and mold hardness readings were made on each specimen. Mold hardness was taken on the flat center of the specimen before stripping from the tube, and plotted (Fig. 2).

When high flowability characteristics develop in the 4-screen sand, it is easily determined by a distinct change in its mold hardness curve.

TABLE 1

Mesh	Lake Sand	Bank Sand
10	0.00	0.00
20	0.13	0.00
30	0.67	0.02
40	2.39	0.06
50	16.02	1.48
70	45.82	13.30
100	33.28	43.27
140	1.23	27.66
200	0.10	10.90
270	0.01	1.89
Pan	[illegible]	1.42

Table 1 . . . Screen analyses of lake sand and bank sand used.

TABLE 2

Mesh	Retained
10	0.00
20	0.08
30	0.41
40	1.43
50	10.20
70	32.81
100	37.28
140	11.80
200	4.42
270	0.76
Pan	0.80

Table 2 . . . Screen analysis of the 60% lake—40% bank sand mixture.

This change is referred to as a yield point, and generally shows up between the 7th and 8th ram specimens. Green strength variations may move this yield point to the right or left, but it is always found in the proper 4-screen distribution. Other screen distributions have not developed this yield point in test work.

Mold hardness readings are thus indicative of screen analysis. As hardness readings deviate toward the other curves, the chart will point out the change. By alteration of sand additions, the sand can be brought back in balance before loss of flowability occurs. These curves can only be developed by each foundry under its specific conditions.

Works better later

Excellent results can not be expected with an all-new sand mix. In general, results will begin to show up after one or two weeks' operation. During this period it is necessary to watch closely for changes, particularly in green strength. As flowability increases, green strength rises because the specimen is rammed harder under the standard force applied.

Bentonite should not be reduced during this period since the increase in green strength is due to flowability, not to clay substance. A reduction in bentonite during the period of increasing flowability would result in dirt, cuts and washes.

Green strength for molding sand varies from 7 to 11 psi in normal practice, and these readings can be expected at the start of the sand conversion. The development of flowability and green strength is not accompanied by the normal feel associated with higher readings. On the contrary, the sand begins to develop a soft, flowable feel like that of the stove plate sands used years ago.

To achieve maximum flowability in any mold, the entire mass of sand should be conditioned in the same manner and formulation. The entire mass will then ram at the same rate within the mold. It has been noted that when facing and backing sands are used, results are not as good due to the apparent difference in rates of flow.

High green strength

The unusually high green strengths shown in Tables 3 and 4 point out why cuts, washes, and dirt are not found in castings. Four-screen sands have minimum expansion-contraction characteristics. Coupled with cellulose added to stabilize the sand, this prevents scabs, buckles, and rattails even when rammed to maximum density.

First work

The first work on 4-screen sand was carried on in a captive gray iron shop producing castings varying in weight from ounces to one ton file finish die blocks. Originally, castings were produced in green sand, skin dried, and dry sand molds. Results were average.

The plant had a sand system that included adequate mulling equipment. It was first operated as a natural sand system, and gradually developed into a semi-synthetic system because of core sand dilution occurring during the shake-out of molds. Conventional additions were made of seacoal, bonding clay, cereals, pitch, and other materials.

The first step in improving results was to study the sands. An increase in permeability was achieved through the addition of lake sand to the system. Core room practice was changed so that cores would collapse more completely at the shakeout. This accomplished two things. First, it furnished a sufficient volume of sand to keep the molding system up to volume without other sand additions. Second, the choice

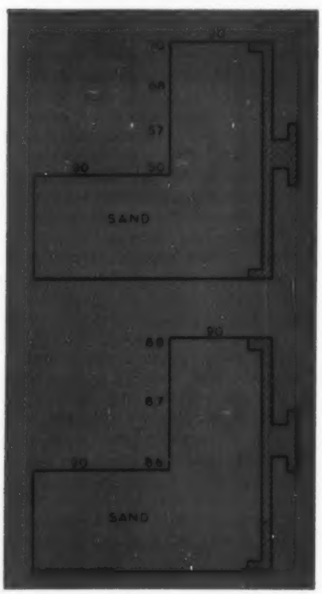

Figure 1 . . . Mold hardness using former (above) and new (below) practice.

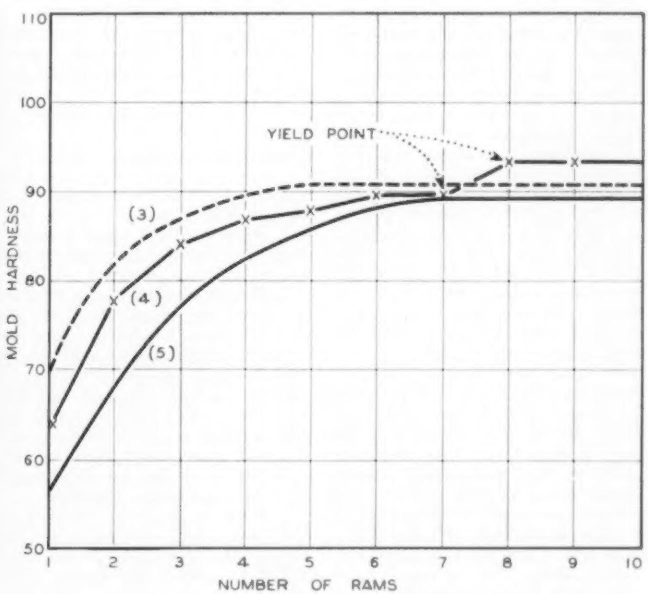

Figure 2 . . . Mold hardness for 3, 4, and 5-screen sands. Only a true 4-screen sand displays the yield point shown between the 7th and 8th rams.

TABLE 3			
Example One - Moisture from 4.6 to 5.0 per cent			
Number of Rams	Mold Hardness	Green Comp.	Green Perm.
1	73	11.5	145
2	80	17.8	105
3	84	23.0	85
4	88	29.5	61
5	89	32.0	52
6	90	37.5	45
7	90	40.0	41
8	92	42.5	38
9	92	47.0	37
10	92	50.5	36

Table 3 . . . Properties of a typical 4-screen sand with moisture content between 4.6 and 5.0 per cent.

TABLE 4			
Example Two - Moisture from 4.0 to 4.6 per cent			
Number of Rams	Mold Hardness	Green Comp.	Green Perm.
1	77	8.8	145
2	82	15.0	105
3	85	19.0	80
4	87	22.5	56
5	88	26.5	47
6	90	29.5	45
7	90	33.0	43
8	92	35.0	40
9	92	37.0	39
10	93	38.0	38

Table 4 . . . Same sand, but with less moisture. Note the unusually high green strength in both examples.

of sand blends produced a 4-screen sand.

Bentonite was next substituted for clay, and a proprietary compound for the carbon additions. This compound was composed of a chemically treated cellulose impregnated with thermosetting and thermoplastic carbons. As the system began to convert to a true 4-screen sand, flowability increased noticeably and castings began to improve, with better finish and less defects.

All castings made in this foundry are now produced in green sand of one basic screen analysis. Accuracy is much better, as shown by the fact that castings are lighter in weight due to less casting swells. Since less swells are found, smaller risers may be used, thus increasing yield. No mold coatings are needed.

A typical new sand mix includes 60 per cent lake sand (52-58 A.F.S. grain fineness), 40 per cent bank sand (90-100 grain fineness), 6 per cent western or southern bentonite, and 2 per cent proprietary carbonaceous facing additive. Typical daily addition for heavy work consists of 6 quarts bentonite and 7 quarts facing additive per 2000 lb system sand. Daily addition for squeezer work consists of 1 quart bentonite and 4 quarts proprietary compound per 2000 lb system sand. As the weight and section of castings increase, the bentonite and facing additive are also increased. By experimentation, standards are easily set which will produce good castings consistently.

The number of men needed to clean and grind castings has been reduced by 60 per cent. In three years of checking this practice, results have been consistent; control is greatly simplified because reasonable variations in sand make-up and moisture have little effect on sand workability and on the castings.

Data not complete

There are still three major questions unanswered.

1. What are the upper limits of sand that may be retained on any one of the four screens?

2. Work so far has been conducted on a 4-screen spread of 50, 70, 100, and 140 mesh. Will similar good results be obtained with a 30, 40, 50, and 70 mesh spread desirable for heavier castings? Or a 70, 100, 140, and 200 mesh spread desirable for lighter castings? It is believed the 4-screen relationship holds, but insufficient work has been completed to make a conclusive statement.

3. What is the real meaning of the yield point in the mold hardness curve? The University of Kentucky foundry research department, under Clifford E. Wenninger, has been working on this phenomenon, and they have indications that it is caused by a shift from a cubical pattern in the sand grain distribution to a rhombohedral pattern. Work will be continued on this subject as part of a fundamental study on sands being sponsored by the Steel Founder's Society of America.

It can be shown mathematically that grains retained on the 100 mesh sieve will just fit into the voids between the grains retained on the 70 mesh. The 140 mesh grains will just fit into the small voids between densely packed 70 and 100 mesh grains. This 4-screen system, properly balanced, attains maximum density under a given amount of ramming.

Conclusions

It is the author's opinion that a 4-screen sand has many desirable properties. The high flowability developed is producing excellent castings in many foundries. It is this flowability that causes the sand grains to compact against the pattern, even on deep draws. This compaction produces high mold hardness, which gives sharp casting definition and smooth finish.

Much of the skill required in ramming is eliminated because the sand, as formulated, cannot be overrammed. The usual instruction to

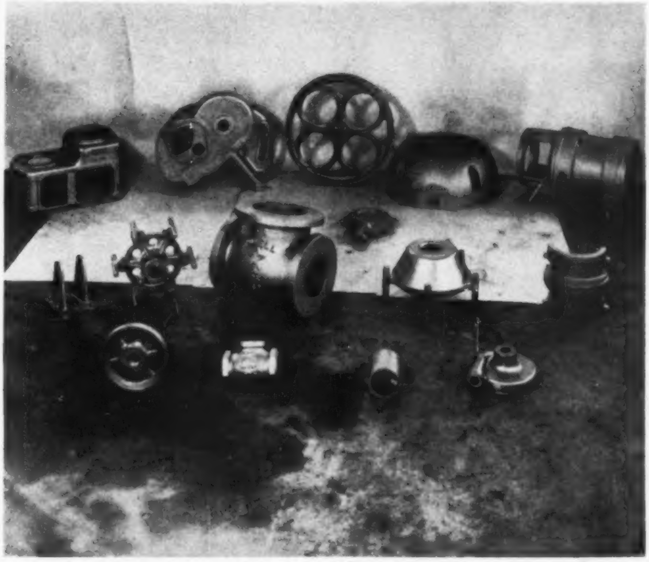

Figure 3 . . . Typical castings made in 4-screen sand by Peerless Foundry Co., Cincinnati. Weight varies from 5 to 650 lb, with metal section variations from 1/4 to 3 inches. Grinding was needed only at parting lines.

the molder is to ram the mold hard. In composition the sand is balanced to absorb expansion, preventing scabs, buckles, and rat-tails. The high green strength induced by both bond and flowability prevents dirt, cuts, and washes.

Three per cent or more sand grains retained on any mesh larger than those in the desired 4-screen series appears to affect casting finish adversely. Sand grains finer than the 4-screen series do not appear to be harmful, if held to reasonable limits. Excessive 200 mesh or pan material requires higher moisture, reduces flowability, and promotes the usual sand defects. In general, it seems that wider than normal variations in standard sand tests have little effect on casting finish.

Discussion

The following comments were contributed by Clifford E. Wenninger, supervisor of foundry research at the University of Kentucky, Lexington, Ky.

■ In the preceding paper, reference is made to work being performed on 4-screen sands at the University of Kentucky under the sponsorship of the Steel Founders' Society of America. This work is a part of a greater study on the fundamentals of foundry bonding sands that is still in progress.

Briefly, Schumacher's work has empirically proven that base sands adjusted to possess a 4-screen grain distribution seem to possess surprising properties with respect to workability and casting stability.

Also for steel

While his investigations have centered upon the application of such sands to gray iron foundries, several instances have become known where such sands have also exhibited superior results when applied to steel castings.

For example, in reclaiming a used steel foundry sand composed of mixed core and mold sands, the reclaimed product emerged with a 4-screen distribution. As a test of the 4-screen influence, the reclaimed sand was rebonded identically with a normal new sand mixture and applied to a pattern notorious for its proneness to scab. Six castings were made, and the only surface defects noted were slight buckles which obviously could be corrected in future castings by small changes in bond additions.

However, the purpose at present is not so much to prove that 4-screen sands can be applied to steel castings as it is to define in a fundamental manner just why such sands seem to possess great physical stability in molding and in pouring.

Hypothesis

The studies at Kentucky have led to the following working hypothesis. Four-screen sands when properly proportioned possess grain distributions that contribute to the creation of "colonies" of grains in which the grains are arranged in geometrical patterns. Because of their geometrical regularity, such colonies possess varying degrees of mechanical rigidity and stability. When a great number of such colonies are present in a sand mass as a whole, they tend to impart a related degree of rigidity and stability to the mass.

Further postulation is that the mysterious shift in yield point during the 7th or 8th ram on 4-screen sands is derived from colonies of sand grains being forced to change from a geometric formation of lower stability—from a cubic arrangement to possibly a rhombohedral arrangement wherein adjacent grains become more closely packed and are provided with an increased number of grain-to-grain contact points between themselves.

The conception of rigid and stable colonies imparting a related degree of rigidity and stability to a sand matrix may eventually prove to be the explanation for the surprisingly high green compression strengths developed with 4-screen sands. An extension of this conception to include increasing mold "brittleness" along with increasing rigidity and stability may provide some indication of why a certain foundry's high-rammed molds actually cracked instead of sagging when placed on uneven bottom boards.

Just guesses

It cannot be overstressed that the foregoing comments are largely theoretical speculation. From a practical viewpoint, a foundryman must at present evaluate the merits of 4-screen sands in accordance with the results obtained by foundries that have used them.

It would be beneficial if others would offer their comments and suggestions on the subject. Meanwhile, the research at Kentucky will continue in its efforts to prove or disprove the foregoing hypothesis on the actions of 4-screen sands.


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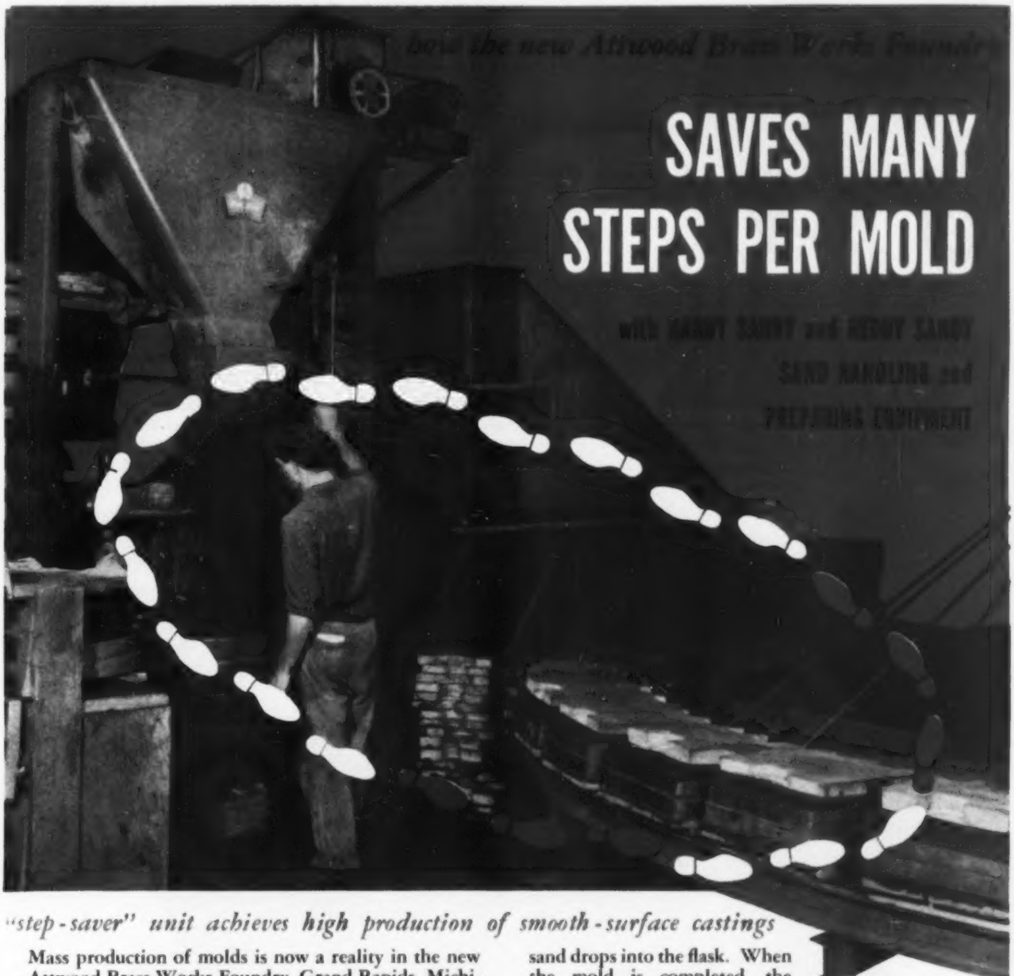

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A F S '52

International Foundry Congress & Show

News Story

International Foundry Congress events of May 5, 6, and 7 are reported this month, concluding the story on Congress meetings and activities which started in the May issue of *American Foundryman*.

■ Monday, May 5, busiest day of the Congress, got off to an early start with a meeting of the National Castings Council in the Hotel Traymore's Chippendale Room at 8:00 a. m. The Council held elections (AMERICAN FOUNDRYMAN, May, page 66) and passed a resolution commending A.F.S. President Walter L. Seelbach, Superior Foundry, Inc., Cleveland, Vice-President I.R. Wagner, Electric Steel Castings Co., Indianapolis, Ind., and Secretary-Treasurer Wm. W. Maloney, Chicago, on the success of the 1952 International Foundry Congress.

Seventeen past presidents of the Society and incumbent President Walter L. Seelbach met for the traditional Past Presidents' Breakfast at 8:30 a.m. at the Traymore's Club Room. Presiding was 1949-50 Past President Edwin W. Horlebein.

The Foundry Show, featuring exhibits of more than 270 foundry equipment manufacturers, suppliers and service organizations opened at 9:00 a.m., as did registration.

The Gray Iron session held at 10:00 a.m. had as its chairman J. D. Sheley, Black Clawson Co., Hamilton, Ohio, with R. A. Clark, Electro Metallurgical Co., division of Union Carbide & Carbon Corp., Detroit, as co-chairman.

First of three papers on cupola practice was that of H. W. Lownie, Jr., and C. T. Greenidge, Battelle Memorial Institute, Columbus, and D. E. Krause, Gray Iron Research Institute, Columbus, on *"How Iron and Steel Melt in a Cupola."*

The authors told of an experiment wherein a small cupola operating at 2880 F was quenched with water and the charge examined. The order of melting was found to be (1) pig iron, (2) cast iron, and (3) steel. All three components decarburized and oxidized on the surface until they began to melt. Cast and pig iron, it was found, melt from the inside out, leaving a shell high in sulphur, low in carbon.

Speaking on *"Melting Iron in a Basic-Lined, Water-Cooled Cupola,"* W. W. Levi, Lynchburg Foundry Co., Radford, Va., covered carbon control, installation, design, air blast, temperature controls, refractory life, banking the cupola, and other phases of operation. He said that the basic cupola is particularly suited to the production of nodular iron because basic irons are low in sulphur and phosphorus content and have reasonably high total carbon.

Third session paper was the Official Exchange Paper from the Association Technique de Fonderie Belgique, *"Metallurgical Blast Cupola,"* by Robert Doat, Compagnie Generale des Conduites d'Eau, Liege, Belgium, and M. A. DeBock, consulting engineer, Brussels.

Metallurgical blast cupola

According to Mr. Doat, advantages of the metallurgical blast cupola are: metallurgical control of reactions, continuous or intermittent operation over 5-day periods, high quality iron, high thermal efficiency, no melting loss from oxidation, ability to use low quality coke, less atmosphere pollution.

Steel session at 10:00 a.m., May 5, was under the chairmanship of Clyde B. Jenni, General Steel Castings Corp., Eddystone, Pa., with Dale Hall, Oklahoma Steel Casting Co., Tulsa, as co-chairman.

First paper presented was by R.A. Dykem Jr., and C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala., and dealt with *"The Substitution of Boron for Alloys in Cast Steel."*

Boron, according to the authors, increases hardenability in carbon and low alloy compositions, just as it does in wrought steels, and its tendency to "fade" can be overcome by normal precautions. The speaker told how boron steel was substituted for 4340 alloy steel in equipment castings at a net saving of over $18 per ton.

Second session paper was *"Application of Chills to Increasing the Feeding Range of Risers"* by E. T. Myskowski, H. F. Bishop and W. S. Pellini, Naval Research Laboratory, Washington, D. C.

In their paper, the authors told how a chill applied to the end of a plate or bar casting is adequate for increasing riser feeding distance when its cross-section is the same as the casting's, and its thickness is the same as that of a plate or half that of a bar. The authors discussed the basic effects of chills as related to

Going over last minute details just before the Wednesday, May 7, Steel session were, left to right: Speakers E. H. Roper, Air Reduction Sales Co., New York, and Sam F. Carter, American Cast Iron Pipe Co., Birmingham, Ala.; Session Chairman C. H. Lorig, Battelle Memorial Institute, Columbus; and Session Vice-Chairman Charles Locke, Atlas Foundry & Machine Co., Tacoma, Wash.

Hundreds of foundrymen took advantage of the extensive program of Congress plant visitations. Here they are enroute to visit New Jersey sand plants in a specially chartered bus.

casting heat flow and solidification.

The Official Exchange Paper from the Institute of Indian Foundrymen, "*Development of Steel Foundries in India*," by N. G. Chakrabarti of Calcutta, was presented by title only, due to its late receipt.

S & H & A P session

At the 10:00 a.m. Safety & Hygiene & Air Pollution session, Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill., presided with J. R. Allan, International Harvester Co., Chicago, as co-chairman. Mr. Allan reviewed what the American Foundrymen's Society has done to make the foundry a good place in which to work and what it is planning to do to make it a better place. The Safety & Hygiene & Air Pollution Program was revived in 1951 at the request of the National Castings Council, he said, to meet the increased need for foundry activity in air pollution and in industrial hygiene. He mentioned the growing problem of noise abatement.

N. H. Keyser presented the paper he prepared with H. P. Munger, also of Battelle Memorial Institute, Columbus, Ohio. Each foundry has a different air pollution problem based on its climate, topography, and operations, he said. He pointed out that the foundryman's problem is complicated because foundry air contaminants cover a wide range of particle sizes with related variation in settling rates.

Dr. D. A. Irwin, Aluminum Co. of America, Pittsburgh, urged foundrymen to think of the total health of their employees because of the possible overlapping of symptoms of personal diseases and industrial health conditions. Management must take the lead, he warned in promoting good foundry hygiene. There is a definite relationship between good housekeeping and working conditions and plant efficiency, he stated.

Timestudy and Methods session at 10:00 a.m., May 5, featured two papers on use of films and one on waste control. Chairman was L. W. Lehman, John Deere Van Brunt Co., Horicon, Wis., with H. R. Williams, Williams Management Engineering, Milwaukee, as co-chairman.

Speaking on "*Use of Motion Pictures for Foundry Motion and Time Study*," W. K. Richardson of Purdue University said that time and motion films are of particular value for short cycle, repetitive jobs; group activity involving a number of jobs; and for problems of layout and indirect labor activities.

M. T. Sell of Sterling Foundry Co., Wellington, Ohio, in discussing "*Application of Motion Pictures for Motion and Timestudy in the Foundry*," showed how a film can be used to develop standard data tables for coremaking. By use of this and similar motion study films, Mr. Sell's company has solved many difficult problems which might have become major grievances. Management and labor together view a film showing an operator working under actual conditions, using certain methods at a given place, he said. The film provides a perfect record of operations, one which is available at any time, and one which tells an impersonal, positive story.

"*Applied Waste Control Principles*," presented by John R. Walley, Helmick & Associates, Canton, Ohio, dealt with six basic steps: (1) spot the source of waste, (2) record the work done, (3) ask questions about the work, (4) write down ideas, (5) get the ideas approved, and (6) put them into effect.

Malleable session at 10:00 a.m., May 5, was headed by Chairman W. M. Albrecht, Chain Belt Co., Milwaukee, and Co-Chairman P. F. Ulmer, Link-Belt Co., Indianapolis.

First speaker J. E. Rehder, Department of Mines and Technical Surveys, Ottawa, Ont., Canada, discussing "*Effect of Phosphorus Content on Graphitization Rate and Mechanical Properties of Blackheart Malleable Iron*," summarized existing literature on the subject and added some new data. According to Mr. Rehder, the principal disadvantage of phosphorus in malleable iron is its tendency to retard annealing.

Alumnus Peter E. Rentschler pins a campaign button on Mrs. Wm. W. Maloney at the A.F.S. Alumni Dinner, May 5.

Apprentice Contest Committee members looking over 1952 entries are, left to right: Jos. E. Foster, A.F.S. Staff; E. J. McAfee, F. W. Burgdorfer and Committee Chairman Roy W. Schroeder.

Each doubling of the phosphorus content increases the time needed for first and second stage annealing about a half and a third, respectively, he said.

"*Malleable Iron Annealing Time Reduced*," by W. G. Wilson and N. F. Tisdale, Jr., Molybdenum Corp. of America, Pittsburgh, told how addition of 0.0015 per cent boron to malleable reduced the annealing cycle considerably. In the first stage of annealing at 1600 F, cementite in boron iron decomposed in 8 hours, contrasted with 16 hours for the base iron.

In the second annealing stage at 1350 F, boron iron showed almost 100 per cent decomposition of pearlite to ferrite in 8 hours. Boron-free iron still showed quantities of pearlite after 24 hours.

Sand session at 10:00 a.m., May 5, had J. B. Caine, consultant, Wyoming, Ohio, as chairman, and R. G. Thorpe of Cornell University as co-chairman.

Speaking on "*Pneumatic Reclamation of Foundry Sands*," C. E. Wenninger, National Engineering Co., Chicago, told about an air-scrubber for reclaiming foundry sands. This unit, Mr. Wenninger said, reclaims a batch of molding sand in from 15 to 30 minutes, and core sand in 45 minutes or less. This reclaiming method, he said, costs roughly $4 per ton, as contrasted to $7.50 per ton for purchasing and handling of new sand.

Dealing with a similar system was a paper by H. H. Fairfield, J. McConachie and H. F. Graham of Wm. Kennedy & Sons, Ltd., Owen Sound, Ont., Canada, on "*Reclaiming Used Molding Sands by Air Scrubbing*." A comparison of sand reclaimed by the process described by the speaker and of new sand showed that the reclaimed sand compares as follows: permeability—just about the same; green deformation—greater; green compression strength—under 2 psi; green mold hardness—lower; dry compression strength—higher; expansion—same; hot strength at 1000 F—lower; hot strength at 2500 F—lower.

British exchange paper

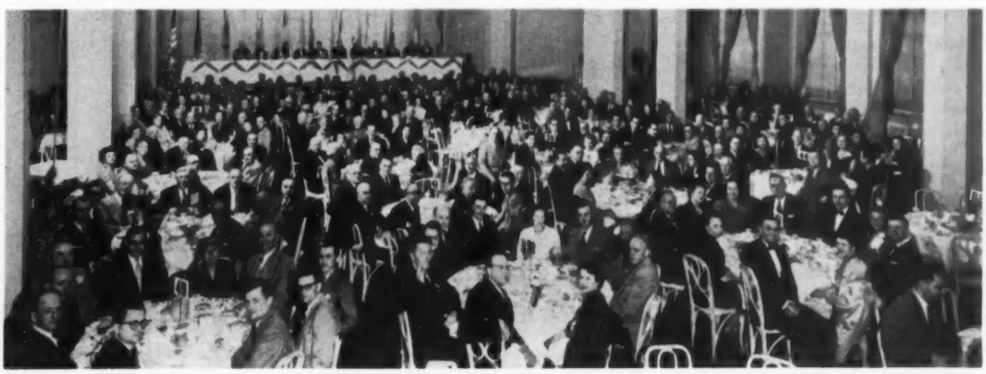
W. B. Parkes of the British Cast Iron Research Association presented the Official Exchange Paper from the Institute of British Foundrymen, "*Sand Control with Particular Reference to the Prevention of Scabbing*." Mr. Parkes told how test castings were used in England to study incidence of scabbing and the results coordinated with physical properties of sand.

Results reported were: (1) scabbing does not occur with olivine or zircon, (2) larger quartz grains have less tendency to scab, (3) addition of pitch, coal or boric acid reduces scabbing, but their uses are limited by either a tendency to reduce refractoriness, or by decomposition, (4) wood flour and fibrous materials increase deformation and prevent scabbing, (5) if sand contains materials that become plastic or liquid at room temperature, sand does not tend to scab, (6) sands containing only sand and clay have a low deformation and collapse rapidly once maximum stress is reached. Wood flour or fibrous material offsets this.

Malleable luncheon

Malleable Round Table Luncheon, held Monday noon at the Hotel Traymore, had James H. Lansing, Malleable Founders' Society, presiding, and W. A. Kennedy, Grinnell Co., Providence, R. I., as co-chairman. There were two discussion topics. The first dealt with "*Dielectric Core Baking*," headed by a panel made up of K. H. Hamblin, Grinnell Co., Providence, R. I., and P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill. Second discussion, on "*Fluidity Tests*," was led by Philip C. Rosenthal of the University of Wisconsin.

An innovation in Educational Division Convention programs was the Chapter Education Activities session, started at 2:00 p. m. and continued through the 4:00 p. m. session with Fred G. Sefing, International Nickel Co., New York, presiding and Edwin



For the first time this year, the A.F.S. Alumni invited all foundrymen and their ladies to attend the annual Alumni Dinner Monday at the Hotel Traymore's American Room. Reason for the invitation was the appearance of William J. Grede, Grede Foundries, Inc., Milwaukee, foundryman president, National Association of Manufacturers, as speaker.

It's always fair weather when old timers get together. Enjoying themselves at the Alumni Dinner are, from left: Past National Presidents Ben Fuller (1918): H. S. Simpson (1942), Wm. H. McFadden (1907) and Alumni Secretary C. E. Hoyt.

W. Horlebein, Gibson & Kirk Co., Baltimore, as co-chairmen.

Representatives of a number of A.F.S. chapters told of the work their respective chapters have done in inducing young men to enter the foundry industry. Speakers were: Earl M. Strick, Erie Malleable Iron Co., Erie, Pa., Northwestern Pennsylvania Chapter; Robert Gregg, Reliance Regulator Div., American Meter Co., Alhambra, Calif., Southern California Chapter; Arnold N. Kraft, Wilkening Mfg. Co., Philadelphia, and H. E. Mandel, Pennsylvania Foundry Supply & Sand Co., Philadelphia, Philadelphia Chapter.

Plant & Plant Equipment session at 2:00 p.m., May 5, dealt with molding machines. Presiding were James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., and R. J. Wolf, Stone & Webster Engineering Corp., Boston.

Molding machines

First session paper was "*Development and Application of Molding Machines for the Production of Light Castings*" by Arthur S. Hedberg and William C. Wick, Wells Manufacturing Co., Skokie, Ill. Modern molding machines, Mr. Hedberg said, came into being shortly after the introduction of compressed air into the foundry in 1895. The speaker showed slides of various types of molding machines through the years and briefly described each.

In his talk on "*Development and Application of Machines for the Making of Molds by Slinging,*" Martin Putz of Mattison Machine Works, Rockford, Ill., began by telling how the first sand slingers came into being. With the aid of slides, he showed details of ramming units, hydraulically operated slingers, jobbing operations, ramming on roller conveyors, turn-table operation, motive slinger operation, standard and production slinger operations.

J. M. Kane, American Air Filter Co., Louisville, Ky., presided at Monday's second Safety & Hygiene & Air Pollution session. "*The Single Objective Approach to Foundry Safety*" of his organization was described by Dan Farrell, United States Steel Co., Pittsburgh. He told how accidents have been reduced by 44 per cent in four years through a program which pays special attention to minor accidents as a step toward elimination of major mishaps.

Air pollution

J. A. Radcliffe, Ford Motor Co., Dearborn, Mich., presented "*Air Pollution and the Cupola,*" Open top iron cupolas without any collecting equipment, he said, emit particulate matter loadings between 0.6 and 2.0 grains per cubic foot of gas expressed at 500 F. This is in excess of practically any known air pollution code, he declared. He described dry

Headliners at the Pattern Round Table Luncheon were, seated left to right: Albert F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee; E. T. Kindt, Kindt-Collins Co., Cleveland; F. W. Burgdorfer, Missouri Pattern Works, St. Louis. Standing, left to right: A.F.S. National Director V. J. Sedlon, Master Pattern Co., Cleveland, and Harry J. Jacobson, Industrial Pattern Works, Chicago.

type collectors, spray and conical washers, wet scrubbers, bag houses, sonic agglomerators, and electrical precipitators.

James T. MacKenzie, American Cast Iron Pipe Co., presided at the 2:00 p.m., May 5, Gray Iron session, with T. J. Wood, American Brake Shoe Co., Mahwah, N. J., as co-chairman.

Basic cupolas

First speaker Sam F. Carter, American Cast Iron Pipe Co., Birmingham, discussing "*Production Experiences with a Basic Cupola*" told of operating a basic cupola with various types of refractories. Cost of these refractories is almost twice that of acid refractories, but this cost is often offset by improved metal quality, he said.

Relaxing just before the Alumni Dinner were, from left: President Elect I. R. Wagner; Wm. J. Grede, president, National Association of Manufacturers, dinner speaker; and A.F.S. National President Walter L. Seelbach.

The basic cupola, Mr. Carter concluded, permits better utilization of poor grade materials, and aids reclamation of scarce metals and manganese. Slags with a basicity ratio of 3.0 or more are advantageous in melting nodular iron, he said.

Second session paper, "*Factors Affecting Fluidity of Cast Iron,*" by Lew F. Porter and Philip C. Rosenthal, University of Wisconsin, explained a tentative formula and chart developed by the authors for predicting relative effects of variations in analysis and pouring temperature on fluidity of iron. Conclusions drawn were: (1) mechanism of freezing determines effect of composition on fluidity, (2) carbon has greatest influence on increasing fluidity of hypoeutectic cast iron, (3) manganese reduces cast iron fluidity for hypoeutectic compositions, (4) above 350 F superheat fluidity increases rapidly on a straight-line function as temperature is increased.

Paper by John C. Hamaker, Jr., General Iron Works Co., Denver, and William P. Wood, University of Michigan, dealt with "*Influence of Phosphorus on Hot Tear Resistance of Plain and Alloy Gray Iron.*"

Mr. Hamaker told of studies on the properties of gray iron under actual hot tearing conditions, resulting in a procedure for tensile testing on direct cooling from the liquid state in a sand mold. This, he said, provides a means of measuring gray iron properties shortly after solidification under actual hot tearing conditions.

Getting ready to start the 2:00 p.m., May 6, session on Refractories were, seated left to right: Session Chairman R. H. Stone, Vesuvius Crucible Co., Pittsburgh, and Speaker L. B. Wyckoff of Lewiston, N. Y. Standing are, left to right: Speaker J. D. Custer, Harbison-Walker Refractories Co., Pittsburgh, and Session Vice-Chairman Walter R. Jaeschke, Whiting Corp., Harvey, Ill.

Hot tears

Three papers on hot tears were featured at the 2:00 p. m., May 5, Steel session. Chairman was R. H. Jacoby, Key Co., East St. Louis, Ill., with R. H. Frank, Bonney-Floyd Co., Columbus, as co-chairman.

First paper, "*Metallurgy and Mechanics of Hot Tearing,*" by H. F. Bishop, C. G. Ackerlind and W. S. Pellini, Naval Research Laboratory, Washington, D. C., told of using simultaneous radiography and thermal analysis to determine solidification conditions at time of hot tearing.

A number of interacting variables determine whether tearing will occur when the critical film stage of solidification is reached, the speaker said. These variables fall into two general categories: metal variables—factors determining the nature and duration of the film condition; and mechanical variables—factors determining hot spot and contraction conditions.

Second paper, "*Hot-Tear Formation in Steel Castings,*" by U. K. Bhattacharya, C. M. Adams and H. F. Taylor, Massachusetts Institute of Technology, stated that a critical temperature exists below which cast steel attains sufficient strength and ductility to withstand contraction stresses and tearing. This temperature is below 2475 F for aluminum-killed, low-sulphur mild steel, and below 2400 F for medium carbon

Francis E. Fisher, NPA Foundry Chief, speaking at the Equipment & Supplies Luncheon, May 6. Looking on is C. V. Nass, president of FEMA and NCC.

steel. Tendency of silicon deoxidation to produce hot tears can be offset by the addition of 0.02 per cent aluminum to silicon deoxidized steel.

Final session paper was *"Investigation of Hot Tears in Steel Castings,"* a progress report on the A.F.S. Steel Division's research project. Presented in three parts, the report was given by Gordon W. Johnson, Armour Research Foundation, Chicago, G. A. Lillieqvist, American Steel Foundries, East Chicago, Ind., and Clyde Wyman, Burnside Steel Foundry Co., Chicago. Mr. Johnson outlined the progress of the research at Armour, bringing it up to the stage of industrial testing by American Steel Foundries and Burnside Steel Foundry Co.

Mr. Lillieqvist stated that the sensitivity of the cylindrical test casting depended upon the width of the gate and he recommended changes in pattern equipment to eliminate this variable. Mr. Wyman concluded from his work that: (1) the test casting furnishes reproducible results, (2) it is sensitive to variation in conditions, (3) hot tear incidence is directly related to degree of hot spot concentration, and (4) variation of hot tear incidence between cylinders made from cores of similar mix is directly related to differential density of cores.

At the 4:00 p. m., May 5, Gray Iron Shop Course meeting, R. W. Gardner, Dearborn Iron Foundry, Ford Motor Co., Dearborn, Mich., led a discussion on *"Scrap Control by Sampling."* The discussion centered about selection and testing of proper sample size in quality control of production castings. K. H. Priestley, Vassar Electroloy Products, Inc., Vassar, Mich., presided; co-chairman was E. J. Burke, Hanna Furnace Corp., Buffalo, N. Y.

Simultaneously, at a Sand Shop Course session, W. M. Peterson, M. A. Bell Co., St. Louis, described the use of high density molding materials, particularly zircon sands. Presiding was H. W. Meyer, General Steel Castings Corp., Granite City, Ill., with Frank S. Brewster, H. W. Dietert Co., Detroit, as co-chairman.

A variety of questions and answers was handled by a panel of C. S. Roberts, Dodge Steel Co., Philadelphia; C. E. Westover, Westover Engineers, Milwaukee; and W. A. Gluntz, Gluntz Brass & Aluminum Foundry Co., Cleveland; at the 4:00 p.m., May 5, Foundry Cost session. R. L. Lee, Grede Foundries, Inc., Milwaukee, presided. G. E. Tisdale, Zenith Foundry Co., Milwaukee, was co-chairman.

Principals in the International Education Dinner, held Tuesday, May 6, were, seated from left: Vice-President Elect Collins L. Carter; Tom Makemson, secretary, Institute of British Foundrymen; President Elect I. R. Wagner; Noel Newman, past president of IBF; and A.F.S. President Walter L. Seelbach. Standing, left to right are: Educational Division Vice-Chairman W. J. Hebard; Dr. D. B. Malhotra of India; George K. Dreher, executive director, Foundry Educational Foundation; Marcel Ballay of France; Ove Hoff of Denmark, and Educational Chairman G. K. Barker.

At the 4:00 p. m. Plant and Plant Equipment session, speakers continued with the series of papers on molding equipment started at the 1952 Convention. K. M. Smith, Caterpillar Tractor Co., Peoria, Ill., presented two papers—*"Jolt Rollover Molding Machines for Medium and Heavy Castings"* and *"Special and Automatic Molding Machines."* A second motion picture, supplementing the one shown at last year's Convention, was shown by H. C. Weimer, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago. Title was *"Mechanization in Molding—II."* James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., presided and H. W. Johnson, Wells Mfg. Co., Skokie, Ill. was co-chairman.

Gray Iron session at 4:00 p. m., May 5, was headed by Chairman Wilfred H. White, Jackson Iron & Steel Works, Jackson, Ohio, and Co-Chairman Carl Harmon, Hanna Furnace Corp., Buffalo.

"Commercial Experience with Higher Silicon Nodular Irons," by Richard Schneidewind, University of Michigan, and Howard H. Wilder, Vanadium Corp. of America, Detroit, detailed the following conclusions drawn from experiences of foundries in producing nodular iron:

(1) Yield, tensile strength, and Brinell hardness increase as silicon content increases, (2) elongation drops gradually with increasing silicon, (3) iron properties in as-cast condition are greatly affected by cooling rate and amount of silicon inoculant, and (4) nodular irons with up to 4 per cent silicon can be made that are acceptable to the proposed new ASTM as-cast nodular iron specifications.

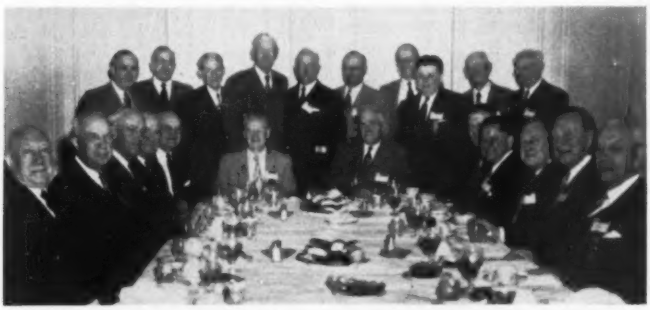
The next paper, *"Effects of Cerium on Graphite Formation in Alloy Cast Iron,"* by E. A. Rowe, University of Washington, Seattle, and H. A. Johnson, General Electric Co., Richland, Wash., told of the effect of cerium on an alloy cast iron containing nickel, manganese and molybdenum.

Cerium, the speaker said, affects graphite structure on all melts. Alone, it produces oriented graphite that lowers tensile strength and produces a pronounced chilling effect.

Addition of a secondary inoculant improves tensile strength and graphite structure and influences acicular pearlite produced.

Alumni dinner

For the first time, the A. F. S. Alumni Dinner—ordinarily attended only by past and present officers and directors and by medallists and honorary life members — was open to all. Held at 7:15 p. m. in the American Room of the Hotel Traymore, the dinner was heavily attended by foundrymen and their ladies interested in hearing Wm. J. Grede, president, National Association of Manufacturers, and of Grede Foundries, Inc., Milwaukee, speak on *"Our Free Enterprise."* Past President Walton L. Woody, National Malleable & Steel Castings Co., presided.



Seventeen A.F.S. Presidents, past and present, attended the annual Past Presidents' Breakfast at the Hotel Traymore on May 5. Seated clockwise around table from left are: G. H. Clamer (1923), W. R. Bean (1920), Henry S. Washburn (1939), Marshall Post (1938), H. Bornstein (1937), Alumni Secretary C. E. Hoyt, Edwin W. Horlebein (1949), Guest William J. Grede, L. N. Shannon (1940), W. B. Wallis (1948), Vice-President Elect Collins L. Carter; Walton L. Woody (1950). Standing, left to right: Secretary-Treasurer Wm. W. Maloney, Ralph J. Teetor (1944), Herbert S. Simpson (1941), Wm. H. McFadden (1906), James L. Wick, Jr. (1936), Fred J. Walls (1945); incumbent President Walter L. Seelbach, Max Kuniansky (1947), Ben D. Fuller (1917); Secretary Emeritus R. E. Kennedy.

Program for Tuesday, May 6, began at 8:30 a. m. with a breakfast meeting of the Foundry Educational Foundation Advisory Group engineering school and student delegates in the East Room of the Claridge Hotel. Foundry Show Exhibits and registration opened at 9:00 a.m. Plant visitation groups departed at the same time for a bus tour of New Jersey silica sand plants.

First Tuesday technical session, at 10:00 a. m., was sponsored by the Foundry Cost and the Timestudy and Methods Committees with R. L. Lee, Grede Foundries, Inc., Milwaukee, presiding, and M. E. Annich, American Brake Shoe Co., Mahwah, N. J., as co-chairman.

Only one paper was presented at this session, *"Pricing Castings Using Standard Costs,"* By J. A. Westover, Westover Engineers, Milwaukee. In his talk, Mr. Westover told of a pricing method that can be used as a pattern for foundry cost work.

Titled the Standard Cost Plan, Mr. Westover's method is based on three essentials: (1) keeping a record of every casting operation, (2) revising conversion figures to reflect changes in cost of labor, materials, etc., and (3) maintaining a consistent relationship between selling price and actual cost. Mr. Westover, in describing his system, strongly advocated pricing of castings by the piece rather than pound.

Education session at 10:00 a. m., Tuesday, May 6, had as its chairman George J. Barker, University of Wisconsin, with W. J. Hebard, Continental Foundry & Machine Co., East Chicago, Ind., as co-chairman.

First session speaker, J. D. Judge of Hamilton Foundry & Machine Co., Hamilton, Ohio, impressively discussed a topic of vital interest to the future of every foundry, large or small, in his talk on *"Management's Responsibility in Training"*.

In discussing *"Apprentice Training — It Is Needed,"* Maurice C. Sandes, Mare Island Naval Shipyard, Vallejo, Calif., predicted a large scale shortage of skilled molders and coremakers. This shortage, he said, will be largely due to lack of interest

Two busy men enjoying a moment of relaxation during the Congress were, left, Secretary-Treasurer Wm. W. Maloney and FEMA Secretary A. J. Tuscany.

and planning on the part of the foundry industry. The nation's youth must be given adequate apprentice training if the supply of skilled craftsmen is to be adequate to meet industry needs, Mr. Sandes continued, and the only way to fulfil this need is to establish a nation-wide plan for apprentice training.

Gray Iron session at 10:00 a. m., May 6, had F. T. McGuire, Deere & Co., Moline, Ill., as chairman, and W. A. Hambley, Chas. A. Krause Milling Co., Birmingham, Mich., as session co-chairman.

Lead-off session paper was *"Effect of Sulphur on the Fluidity of Gray Cast Iron,"* by Lew F. Porter and Philip C. Rosenthal of the University of Wisconsin.

Experiments at the University of Wisconsin in developing a laboratory melting technique that shows the effects of sulphur reveal that sulphur has an adverse effect on fluidity only when it is combined with enough manganese to form sulphides of high manganese content. Pouring temperature is also an important variable in altering the influence of sulphur, it was reported.

Using these experiments as a basis, a program was set up to study sulphur's effect on phosphoric gray iron poured at temperatures from 2400 F to 2800 F. It was concluded that sulphur had little or no effect on fluidity up to 2400 F, but that the amount of sulphur which can be tolerated at 2500 F and above without affecting fluidity increases with pouring temperature.

Second session paper, *"Internal*

Porosity in Gray Iron Castings," was presented by John C. Hamaker, General Iron Works Co., Denver; William P. Wood, University of Michigan; and F. B. Rote, Albion Malleable Iron Co., Albion, Mich.

The speaker reported research to determine the mechanism of internal porosity and to fix the composite levels at which it appears. Analysis of cooling curves, he said, show that liquid and solidification contraction of the low-melting network of phosphide eutectic in solidified iron provides the only possible mechanism for internal porosity.

"Effect of Hydrogen on Graphitization," presented by F. Brown, North Carolina State College, and M. F. Hawkes, Carnegie Institute of Technology, reported results of a literature search on the subject. Covered by the search were graphitization of cementite, eutectic graphite, gamma-range graphitization, stable eutectoid reactions, and subcritical graphitization of cementite.

Heat transfer

Presiding at the 10:00 a.m., May 6, Heat Transfer session was H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland. E. C. Troy, foundry engineer, Palmyra, N. J., was session co-chairman.

First paper was given by Victor Paschkis, Columbia University; title was *"Heat Flow in Moist Sand."* Mr. Paschkis reported further developments in research undertaken for the A. F. S. Heat Transfer Committee at Columbia University on determination of heat flow in sand.

It has been determined, Mr. Paschkis said, that thin castings will freeze in considerably shorter time under the influence of moisture content. Influence of moisture in thick castings, however, is limited to the increase of solidification rate of the first layer to freeze. The total solidification time of thick castings is not influenced, Mr. Paschkis concluded.

R. P. Dunphy and W. S. Pellini, Naval Research Laboratory, Washington, D. C., in their paper *"Solidification of Nodular Iron in Sand Molds,"* told of an investigation into the effect of foundry variables on establishing the mode of solidification of nodular iron from sand walls. Sequence of solidification, the speaker said, consists of the removal of superheat, formation of austenite dendrites at the liquidus hold temperature, growth of dendrites, and the beginning and ending of eutectic solidification.

Steel session at 10:00 a. m., May 6, was devoted to Statistical Quality Control. H. H. Johnson, National Malleable & Steel Castings Co., Sharon, Pa., presided, with R. W. Gardner, Ford Motor Co., Dearborn, Mich., as co-chairman.

Steel quality control

First session speaker was W. R. Weaver, president, American Society for Quality Control, Republic Steel Corp., Cleveland, who discussed *"The Whys and Wherefores of Statistical Quality Control."*

In outlining the various methods and functions of quality control, Mr. Weaver said that it is a broad collection of useful tools rather than a single tool. Use of quality control sharpens judgment by providing facts instead of opinions. In this way it obtains correct answers to highly complex foundry problems, eliminating mistakes and saving time and energy. Quality control, Mr. Weaver concluded, tells what action is needed and more important, what action is *not* needed.

E. L. Fay, Deere & Co., Moline, Ill., speaking on *"Management Looks at Quality Control,"* pointed out its value to management in raising product quality and in reducing scrap and salvage costs. He outlined the reasons for establishing a quality control system in the foundry, told how to set up a program, and cited many case histories wherein a quality control program has greatly increased production and betterment of products.

The Gray Iron Round Table Luncheon was held in the Renaissance Room, Ambassador Hotel, at noon, May 6. R. J. Allen, Worthington Corp., Harrison, N. J., presided and C. O. Burgess, Gray Iron Founders' Society, Cleveland, was co-chairman. The luncheon featured an informal exchange of information on *"Reclamation of Gray Iron Castings"* and the presentation of a *"British Report"* by A. B. Everest and F. A. Ball, Mond Nickel Co., Ltd., London.

Equipment luncheon

Representatives of equipment and supply firms met at lunch in Trimble Hall, Hotel Claridge, at noon May 8, to hear Francis E. Fisher, chief, Foundry Equipment & Supplies Sec., Metal Working Equipment Div., NPA, Washington, D.C. C. V. Nass, president, Foundry Equipment Manufacturers' Association, and Edw. H. King, vice-president, Foundry Facing Manufacturers' Association, Hill & Griffith Co., Cincinnati, presided. In an off-the-record talk, Mr. Fisher indicated that the long-range attitude tended toward decontrol.

Tuesday afternoon's program began with a Refractories session at 2:00 p.m. Presiding was R. H. Stone, Vesuvius Crucible Co., Pittsburgh, with W. R. Jaeschke, Whiting Corp., Harvey, Ill., as co-chairman.

First session paper, presented by J. S. McDowell and J. D. Custer of the Harbison-Walker Refractories Co., Pittsburgh, dealt with *"Fundamentals of Foundry Refractories."*

Mr. Custer covered the many types of refractories used in the metal castings industry, describing the properties and applications of each in the foundry. He called attention to foundry advances which were dependent on progress in refractory manufacture.

"Effect of Slag on Furnace Linings," by L. B. Wyckoff of Lewiston, N.Y., dealt primarily with chemical reactions. Mr. Wyckoff outlined step-by-step the formation of slag, from charge to slag tap hole. Using slides, Mr. Wyckoff explained four binary systems and two ternary systems of foundry slags.

Second Steel session on Statistical Quality Control was held at 2:00 p.m., May 6, with A. A. Evans, International Harvester Co., Indianapolis, as chairman, and George Ver Beke, John Deere Malleable Works, East Moline, Ill., as session co-chairman.

Session dealt with statistical quality control as applied to malleable and steel foundries, with one paper on each. First paper was by E. F.

Price and O. K. Hunsaker, Dayton Malleable Iron Co., Ironton, Ohio, on *"Quality Control in a Malleable Foundry,"* while the second, by H. H. Fairfield, Wm. Kennedy & Sons, Owen Sound, Ont., took up *"Quality Control in a Jobbing Steel Foundry."* Both papers described systems that have proved successful in producing better casting methods and products. Success of such systems, the authors concurred, is dependent upon collecting correct data and acting on it promptly and upon cooperation between all foundry departments at all times.

Timestudy & Methods session at 2:00 p.m., May 6, was under the chairmanship of J. E. Hyland, John Deere Spreader Works, East Moline, Ill., assisted by C. J. Pruett, McWane Cast Iron Pipe Co., Birmingham, Ala., as co-chairman.

Speaking on *"Standards for Rough Chipping and Removing Welds,"* Dean Van Order, Burnside Steel Foundry Co., Chicago, told of a system of standards evolved by trial-and-error at Burnside. Features of this system, he said, are: (1) Rewarding operators in proportion to individual effort, (2) control and allocation of work backlog by the cleaning room foreman, (3) elimination of the "chipping room bottleneck," (4) tying chipping and weld removal costs directly to each casting, (5) progress of new operators can be seen at a glance, and (6) easy detection and correction of poor operations.

"Melt Department Incentive Plan," as described by Erwin G. Tetzlaff, Pelton Steel Casting Co., Milwaukee, has three basic components. The first deals with quality of melt, wherein each melter-helper team is paid on a separate incentive basis. The second part covers quantity of melts, or man hour per heat, in which all melters and helpers share as a group. The third part of the plan is based on savings in power. All melters share in incentive pay for this as a group. As a result of this three-part plan, Mr. Tetzlaff said, his plant has had few "off analysis" heats and melters and helpers have a spirit of competition and cooperation.

Heat Transfer session at 2:00 p.m., May 6, had as its chairman H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland, and as co-chairman E. C. Troy, foundry engineer, Palmyra, N. J.

"A Simplified Analysis of Riser Treatments," presented by C. M. Adams, Jr., and Howard F. Taylor, Massachusetts Institute of Technology, was a brief analysis of heat flow in risers.

Several different riser treatments were analyzed by the speaker, among them: inert radiation shield on top of riser; insulating sleeve surrounding riser; metal-producing exothermic material on top of a short riser; mildly exothermic material on top of a short riser; moldable exothermic sleeve surrounding riser; and heat applied externally to riser by arc or induction.

Official Exchange Paper from the Netherlands Foundrymen's Association, *"Practical Consequences of Space, Time and Temperature Relations During Casting of Metals," by* J. S. Abcouwer, Werkspoor, N.V., Amsterdam, was presented at the Congress by A. Baron Krayenhoff of Amersfoot, Netherlands. The paper dealt with relationships between the variables and fairly constant physical qualities that affect temperature distribution in cooling metal castings.

J. E. Rehder, Department of Mines and Technical Surveys, Ottawa, Ont., Canada, presided at the 4:00 p.m., May 6, Gray Iron session. Co-chairman was V. A. Crosby, Climax Molybdenum Co., Detroit.

All three session papers dealt with the metallurgy of nodular iron. First of these was *"Effect of Percentage of Nodular Graphite on Certain Mechanical Properties of Magnesium-Treated Cast Iron,"* by R. W. Lindsay, Pennsylvania State College, and Alvin Shames, North American Aviation, Inc., Columbus, Ohio.

Second session paper was written by J. Keverian, C. M. Adams and H. F. Taylor of Massachusetts Institute of Technology and dealt with *"Time of Formation of Spherulites in Hypo- and Hyper-Eutectic Irons."*

Mr. Keverian also presented the third session paper, *"A Study of the Formation of Nodular Graphite,"* written by Fredrik Hurum of the Norway Institute of Technology.

Tuyeres discussion

"Mechanics of Tuyeres," subject of the 4:00 p.m., May 6, Gray Iron Shop Course discussion, received a thorough going-over by session attendants under the leadership of Howard H. Wilder, Vanadium Corp. of America, Detroit, and Carl Harmon, Hanna Furnace Corp., Buffalo, N. Y. W. W. Levi, Lynchburg Foundry Co., Radford, Va., presided, with E. J. Burke, Hanna Furnace Corp., as co-chairman.

The May 6, 4:00 p.m. Sand Shop Course meeting brought out a variety of *"Household Hints and Tips"* as a panel offered ideas easy to put into effect in a foundry. Bradley H. Booth, Carpenter Bros., Inc., Milwaukee, and R. H. Olmsted, Whitehead Bros. Co., New York, were co-chairmen.

Members of the panel were: T. E. Barlow, Eastern Clay Products Div., International Chemicals & Minerals Co., Jackson, Ohio; Tom W. Curry, Lynchburg Foundry Co., Lynchburg, Va.; R. L. McIlvaine, National Engineering Co., Chicago; O. J. Myers, Archer-Daniels-Midland Co., Minneapolis; C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago; John A. Rassenfoss, American Steel Foundries, East Chicago, Ind., Jos. S. Schumacher, Hill & Griffith Co., Cincinnati.

Joint session on Refractories and Gray Iron at 4:00 p.m., May 6, had R. A. Witschey, A. P. Green Fire Brick Co., Chicago, presiding and S.

continued on page 105

Last word on the Congress, as usual, belongs to the ladies, more than a thousand of them, who brightened the many social events. Here are a few of them shown at the Ladies Luncheon and Fashion Show at the Ambassador Hotel, May 5.

Foundry training in vocational school starts to pay off

Last fall a program of foundry education was initiated in a vocational school in Michigan. This article tells how future foundrymen can be indoctrinated with foundry "savvy" without benefit of special instructors, expensive equipment, or drastic revision of school courses.

T. T. LLOYD / *Vice-president, Albion Malleable Iron Co., Albion, Mich.*

■ The foundry orientation program initiated last fall by the Central Michigan Chapter of A.F.S. has by now achieved considerable success and momentum. Program was designed to acquaint secondary school students with the place of the foundry in industry by integrating certain phases of foundry work with already established school courses. It was set in motion last fall at Battle Creek Vocational School, Battle Creek, Mich.

By tying in actual foundry work with such classes as drawing, woodworking, and machine shop, the program has cleared away many of the misconceptions that surround foundry practice. The students were initially short on foundry knowledge and skill, but this was quickly corrected by the help and encouragement given by local foundrymen.

The frequent contacting of the school by members of the chapter supplanted the need for formal education or lectures. Each visit usually resulted in an explanation of some phase of foundry practice. Two plant tours were arranged for the students to give them an idea of foundry operation. One of these was at Albion Malleable Iron Co., Albion, Mich., the other at Engineering Castings, Inc., Marshall, Mich.

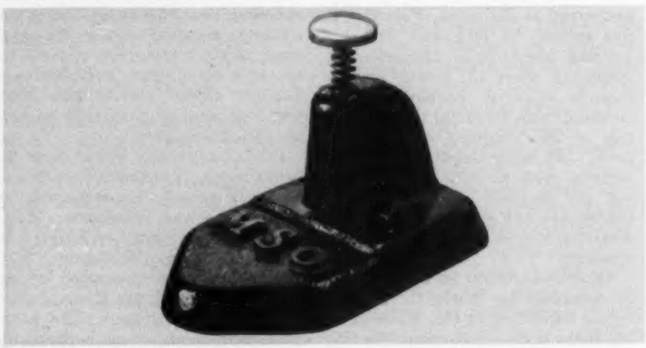
First, easy steps

A step-by-step procedure laid out by Ashley B. Sinnett, an F. E. F. scholarship student majoring in Industrial Arts at Michigan State College, East Lansing, enabled the students to draw on past experience and coordinate it with foundry functions. Procedure is so set up that a basic and overall conception of the foundry business is gained.

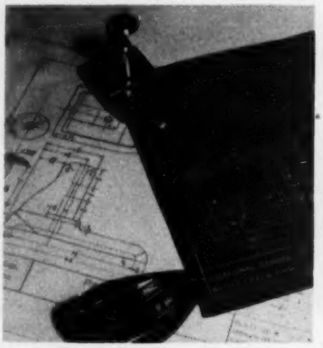
First project at Battle Creek was a paper punch, based on a photograph of a punch made by students at Michigan State College. Design was adapted in mechanical drawing class, pattern was made in woodworking class, and casting, machining, assembling was done in the machine and shop class. Imagination was given free rein, with the result that the finished punches ranged in design from flat iron and steamboat to Mae West, embellished with initials, names, dates, and the Battle Creek bear cat.

Next, harder ones

Ambition quickly outstripped mere paper punches and turned to such miscellaneous items as drill holders, gage holders, and draw



The Michigan State College paper punch. This photograph was the only data furnished the students from which to design and fabricate their own models.



Working drawings, pattern, and completed paper punch resulting.

Examples of student work include a draw shave, drill and scale holders.

Coremaking is direct and simple. Core in work here is for the bench grinder.

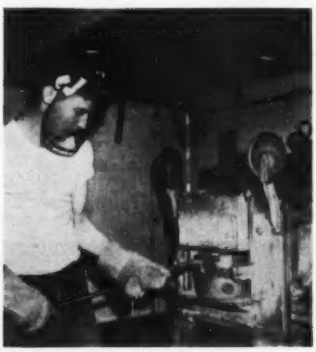
Corebaking is done in the school's electric heat treating furnace.

Cutting gates, risers, and runners is entirely a hand operation.

shaves. One of the more difficult projects was the making of several castings for a bench grinder. This was inspired by some pictures of a bench grinder seen in a magazine by three of the students, David Smith, Charles Jarstfer, and Robert Herwarth.

Neither they nor their instructor, G. Avery Aten, knew how to make cores or hold cores in place with core prints; but despite this technical handicap they made some very fine castings which offer no evidence of lack of core knowledge. This was one of those fortunate occasions on which a member of the chapter happened to drop by Battle Creek in time to straighten out affairs. Mr. Aten, in fact, knew nothing about foundry or foundry practices before the program, and has had a serious uphill fight to keep ahead of his 20 students.

No problem at all, however, was the question of suitable tools and equipment. After the chapter's initial donation of such miscellaneous foundry tools as sprue and gate cutters, slicks, and a babbit ladle, the



Safety measures are carefully observed in Battle Creek's melting process.

Pouring aluminum into sand molds. Mold flasks were made by students.

SUGGESTED PROCEDURES FOR THE DESIGN, PATTERNMAKING, CASTING, MACHINING, AND ASSEMBLY OF PAPER PUNCH

I. From photograph:
- A. Design and sketch casting.
- B. Make working drawing of the casting, considering the following:
  1. Draft.
  2. Shrinkage.
  3. Section Size.
  4. Excess metal for machining.
  5. Machining details.
  6. Exploded details for assembly of punch rod, spring, plate.

II. From drawing:
- A. Construct pattern, stressing:
  1. Draft.
  2. Shrinkage.
  3. Section size.
  4. Waxing.
  5. Shellacking.
  6. Draw hole.
  7. Ornaments.

III. Mold pattern and pour:
- A. Use of molding tools:
  1. Sprue cutter.
  2. Gate cutter.
  3. Lifter.
  4. Slick.
  5. Trowel.
  6. Hammer and riddle.
  7. Draw screw.
- B. Flask and sand:
  1. Elementary nomenclature.
  2. Ramming techniques.
- C. Inserting steel punch plate.
- D. Melting:
  1. Charging the crucible.
  2. Control of fuel (oil or gas).
  3. Temperature control.
- E. Pouring:
  1. Handling crucible in shank.
  2. Fluxing.
  3. Skimming.
  4. Rate of pour.
  5. Pig excess metal.

IV. Machining operations:
- A. Plan One:
  1. Drill vertical hole through casting (single diameter).
  2. Machine sleeve to fit inside hole. This acts as spring base, is held by set screw.
  3. Use hack saw to make paper slot.
  4. Make punch rod and hand cap.
  5. Grind sharp edge on punch rod.
  6. Wind spring.
- B. Plan Two (arbitrary figures are used in order to clarify):
  1. Drill from top with 3/16" drill for 1 1/8".
  2. Using 3/16" hole for pilot, redrill for 1" with 1/4" drill.
  3. Invert and drill for 7/8" with 1/4" drill, thus leaving an internal collar for the spring base. Use jig for all drilling.
  4. Machine punch rod with minimum clearances.
  5. Machine punch rod.
  6. Mill out paper slot.
  7. Grind sharp edge on punch rod.
  8. Wind spring.

This is the step-by-step procedure planned by Mr. Sinnett. Notice its scope and the clear tie-in between foundry practices and standard vocational training.

Student at right is ramming a cope to put over the completed drag at left.

The four at left, from left to right, are R. S. Hale, G. Avery Aten, F. B. Rote, and T. T. Lloyd. Behind students at right are D. W. Boyd and Patrick Settanni.

students made their own. Flasks, coreboxes, patterns, and the rest of the molding tools were all "homemade". The chapter also purchased a copy of the A.F.S. book, "Foundry Work", by Edwin W. Doe, and an A.F.S. membership for school director R. S. Hale.

Melting was done in a gas-fired heat treating furnace. Core baking was done in an electric heat treating furnace. Local foundries contributed sand and scrap aluminum. The students themselves instituted a scrap drive that brought in quite a little.

As soon as the program developed some concrete results, the entire Central Michigan Chapter was invited to watch a demonstration by the students and see a display of their work. During the demonstration, the boys took off three separate aluminum heats and went through the basic foundry operations of mold and core sand preparation, coremaking and baking, molding, melting, pouring, and shakeout.

In return, the chapter invited the three students who undertook the bench grinder project and their instructor to attend the chapter's regular dinner meeting. There F. G. Sefing, International Nickel Co., New York, spoke on "The Foundry's Responsibility for Training Young Men". Technical chairman for the evening was Albert E. Rhoads, Engineering Castings, Inc., Marshall.

The foundry orientation program was originally developed by the chapter with the help and cooperation of R. S. Hale, director of industrial training for the Battle Creek public schools; David W. Boyd, Engineering Castings, Inc., the chapter's educational chairman; and Professor C. C. Sigerfoos and Ashley B. Sinnett, both of Michigan State College. Considerable time and effort was also contributed by Frank B. Rote and Patrick Settanni, Albion Malleable Iron Co., Albion, Mich.; and Jack F. Secor, Hill & Griffith Co., Niles, Mich.

Mr. Aten had the cooperation of H. A. Colburn and A. W. Anderson, instructors at Battle Creek. Program publicity has been handled by John T. Ehman, Albion Malleable Iron Co., the chapter's publicity chairman. John H. Eggleston, also of Albion Malleable, has been responsible for the excellent photography.

One of the clearest indications of the program's success is the enthusiasm displayed by the students, who have already turned out some 30 different pieces of casting work at negligible cost. The program is spreading to other public schools; a similar one is already under way at the school in Charlotte, Mich., largely due to the efforts of Mr. Sinnett. As in Battle Creek, the students at Charlotte made all the equipment, with the exception of a few items donated by Michigan State College. Their melting is done in a three-pint graphite pot, with a forge as the furnace.

▶ *Foundry's publication cited*

Double winner of citations from Freedoms' Foundation, Valley Forge, Pa., this year is "Foundryways," house organ of Belle City Malleable Iron Co., Racine, Wis. "Foundryways" itself won an award for its contributions toward a better understanding of freedom, and to Editor Elaine Kitto went a citation for her article, "The Opportunity of Freedom." Shown above in a ceremony broadcast over two radio stations on April 29 are, left to right: Kenneth D. Wells, president, Freedoms' Foundation; Miss Kitto, and C. S. Anderson, president of Belle City Malleable. The Foundation annually awards $100,000 to organizations and individuals whose writings further the cause of a free world.

Shop talk

Practical questions and answers

▶ Chemical analyses

A survey of recent literature seems to indicate that chemical analysis of castings is of very little value compared to structure. Structural analysis would require less expensive apparatus—polishing discs, a microscope, and etching chemicals.

Would an arrangement of this sort be advantageous to a small foundry? Where can data be obtained on preparing samples, etching, acids, reagents, etc? What magnification is required for work of this nature?

Although final structure is of paramount importance and is the governing factor in establishing mechanical properties and machinability, it is still true—at least for all government purchases—that chemical limits for the various contained elements are also a part of the specifications.

Visual examination through the microscope can be made with relatively inexpensive equipment. A microscope of this kind with suitable illumination probably will range from \$350 to \$550. Lenses should be provided for making examinations at 100, 500, and 1000 diameters.

The samples are prepared by first grinding the surface flat (being careful not to overheat it) followed by hand polishing on abrasive papers, starting with 0, then 00, and finally 000 paper. The sample is next usually polished on a lap covered with canvas to which an application of about 600 grit carborundum suspended in water has been applied.

After removing the scratches left by the 000 paper, the sample is carefully washed and then polished on a lap covered with a material like velveteen, using any of several very fine abrasives suspended in water. This may be opticians rouge, levigated alumina, or levigated chromic oxide.

Polishing is conducted on this lap until the sample is scratch-free, but care must be exercised to avoid relief polishing. Some considerable practice is required to prepare metallographic specimens that are free of scratches, unmutilated, and not gouged.

After polishing, the sample must be promptly washed, usually with a cotton swab, finished in warm water, and then dried by applying alcohol and subjecting the surface to a blast of dry, hot air.

When the sample has cooled to room temperature, gray iron or the usual alloys of steel may be etched with a 1½ to 3 per cent solution of concentrated nitric acid in ethyl alcohol. Since the solution rate of various structures varies considerably, the time required differs and must be judged by experience in order to obtain a properly etched surface. Usually from 3 to 4 seconds is necessary, followed by immediate washing in running cold water and then hot water, followed by alcohol and prompt drying in a blast of hot air.

Additional details on preparation and etching techniques for various alloys are contained in the handbook of the American Society of Metals and various publications available from the American Society for Testing Materials.

▶ Bed coke heights

In the A.F.S. Handbook of Cupola Operation *there is a table on pages 20 and 21 in which are indicated the bed coke heights above the tuyeres for the different sizes of cupolas. Do these coke bed heights include the first charge of coke necessary to melt the first charge of iron?*

Where a definite height of bed coke is specified, it is customary to consider that the first charge will be melted by the bed coke, and that succeeding charges of metal will be melted by their coke increments, the so-called after charges or splits.

▶ Control of shrinkage

We are experiencing considerable trouble with excessive shrinkage in our castings, approximately 3/16 in. per foot in the base iron. How can we maintain our shrink between 1/10 and 1/8 limit?

It is our belief that excessive shrinkage in iron is due to low free carbon content. Free carbon (graphite) tends to balance the normal contraction of the metal as it solidifies.

If your iron is lower in *total* carbon than you believe normal, we would strongly recommend that you increase this carbon content. An undesirable high *combined* carbon content may be caused by oxidizing melting conditions, large percentages of steel scrap, large amounts of heavily rusted scrap in the charge, or at times an ill-balanced manganese-to-sulphur ratio. For ordinary gray irons having from 0.10 to 0.14 per cent sulphur, the manganese content should range from 0.60 to 0.80 per cent.

▶ Making furnace cement

What bonding material could be mixed with ground graphite crucible to make a high temperature furnace cement?

A reasonably satisfactory refractory cement may be made from old clay graphite crucibles if they are finely ground and thoroughly mixed with sufficient plastic clay, such as bentonite, and possibly 1 or 2 per cent sodium silicate (water glass) to give it air setting properties.

It is important to only add enough bentonite to give the mixture working characteristics and sufficient bond to hold it together. The addition of either an excessive amount of the clay or sodium silicate will result in high shrinkage and cause the cement to crack after it is dry.

Letters to the editor

All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Says procedure not accurate

▪ The author of *"Testing Sand with Included Combustibles"* (AMERICAN FOUNDRYMAN, March 1952, page 59) has overlooked the combined water content of the clay substance. If the sand had a small amount of clay and a large amount of combustibles there would not be much error involved. But there would be a very large error if the reverse were true.

JAMES T. MACKENZIE, *Tech. Dir.*
American Cast Iron Pipe Co.
Birmingham, Ala.

Replies error is small

▪ Dr. MacKenzie's astute analysis of the clay determination procedure is most welcome. In dealing with synthetic, bentonitic-bonded molding sands whose maximum A.F.S. clay percentage rarely ever exceeds 5 per cent, we are not confronted with a large error. Since bentonites usually do not contain more than 10 per cent combined water, the total error would be approximately ½ per cent using the procedure described.

Natural, illite-bearing molding sands have both high combined water (15 per cent) and represent a greater proportion of the molding material (10 to 15 per cent). In such cases a maximum error of 2.25 per cent could occur.

It is our feeling that the ½ per cent in the case of synthetic sands represents the same amount of error as the 2.25 per cent of the natural sands because of the relative potency of the two types of clay. Of course, extraction and ignition of new pure clay substance, once performed, would give a "blank" value which could be used in the calculation thereby eliminating any possible discrepancy.

O. J. MYERS, *Tech. Dir.*
Archer-Daniels-Midland Co.
Minneapolis

Questions research results

▪ I read with interest the paper by Porter and Rosenthal entitled *"Gray Iron Fluidity Variables—Effect of Composition and Pouring Temperatures"* AMERICAN FOUNDRYMAN, January, p. 53). The work of these investigators has followed closely the lines of work carried out by the writer at the British Cast Iron Research Association (*"The Fluidity of Molten Cast Iron"*, E. R. Evans, *Journal of Research and Development*, British Cast Iron Research Association, October 1951, v.4, pp. 86-139).

Detailed particulars of methods and results were given which indicated the effects of various factors on the fluidity of cast iron. The effects of mold conditions and melting conditions of both good and bad practice were studied, together with those of pouring temperature and the composition variables carbon, silicon, manganese, sulphur, phosphorous, nickel, copper, chromium, molybdenum, titanium, vanadium, zirconium, aluminum, tellurium, boron, cerium, and magnesium. Whilst appreciating the fact that the work of Porter and Rosenthal is as yet not completed, the work now published permits some comparison of their results with mine.

I have shown that fluidity is not a straight line function of the degree of superheat. For all practical purposes, at the temperature of the liquidus the fluidity of molten cast iron is negligible and with increasing pouring temperature, at first the fluidity increased only slightly. At a temperature of approximately 100 C (180 F) above the liquidus the fluidity shows a sudden increase and thereafter the increase of fluidity with pouring temperature is greater, but the relationship follows a curve concave to the temperature axis. This phenomenon was also noticed in the case of molten steel by Worthington (*Proceedings of the Institute of British Foundrymen*, 1950, vol. 43, pp. A.144-A.151.)

The results illustrating the effect of carbon on fluidity are interesting. The sudden decrease in fluidity at a carbon content of 3.48 per cent corresponds with a carbon equivalent of 4.55 (using the formula $C + \frac{Si}{3} + \frac{P}{3}$) which is 0.25 above the normally accepted eutectic composition of 4.3. This shows a similarity to my own work where irons of 4.7 carbon equivalent were produced before there was any noticeable deviation of fluidity properties in this manner. It is interesting to note that cast irons differ from many other alloys investigated in that the composition of maximum fluidity does not correspond exactly to what is usually accepted as the eutectic composition.

Regarding work on the effects of carbon, silicon, manganese, and phosphorus, the investigators have been very bold in drawing conclusions from only 16 experimental heats. In my own work conclusions were based on some 94 compositions from each of which four tests were made in triplicate to investigate the effects of carbon, silicon, and phosphorus alone. It is surprising that the investigators have not considered these of sufficient importance for reference, although their report may have been completed before mine reached the U.S.A. Apparently the results for each heat have been compared with those of their basic heat (I) and differences are quoted as the effect of the particular composition variation. The fluidity differences for composition variations of 1.1 per cent carbon, 1.2 per cent manganese, 1.4 per cent silicon, or 1.0 per cent phosphorus, or combinations of these, are given as 4.3 in. for carbon and 2 in. or less for other changes. But these results are obtained by duplicate tests which vary by more than 1 in. in five of the 16 cases.

The work on the influence of carbon content has shown that very small variations of this element cause marked changes in the fluidity of cast iron and it would therefore seem that each heat should be judged on its intrinsic carbon content rather than on averaged carbon contents. The same argument applies to a lesser extent to the results of the effects of the other elements.

The composition factor $C + \frac{Si}{4} + \frac{P}{2}$ has been determined from these results, but it is obvious that an error of 1 in. of fluidity measurement on the results for carbon alone can make this factor vary from $C + \frac{Si}{3} + \frac{2P}{3}$ to $C + \frac{Si}{5} + \frac{2P}{5}$. The factor has been related to the liquidus temperature which in turn has been related to a fluidity at a temperature of 350 F (194 C) above that of the liquidus, an apparently unnecessary complication.

The factor derived from the work carried out by the British Cast Iron Research Association is $C + \frac{Si}{3} + \frac{P}{2}$. This factor was determined by much more exact experiment, the work being concerned with the effects of the elements carbon, silicon, and phosphorus on the fluidity of irons at a definite temperature. For instance, an increase of 1 per cent carbon increases the fluidity of an iron at 1400 C (2552 F) by about 22 in. The same increase in carbon content increases the fluidity of cast iron at a temperature 150 C (270 F) above the liquidus by about 6 in. It can be seen from this that an error of 1 in. in the spiral measurement is much more serious in the latter case, being an error of 16 per cent whereas in the former case the error is only 4.5 per cent.

I have replotted the results of the work of Porter and Rosenthal using each of these four composition factors and it is significant that in all cases a straight line can be drawn satisfactorily through the points. Incidentally, this is also the case when the commonly

continued on page 111

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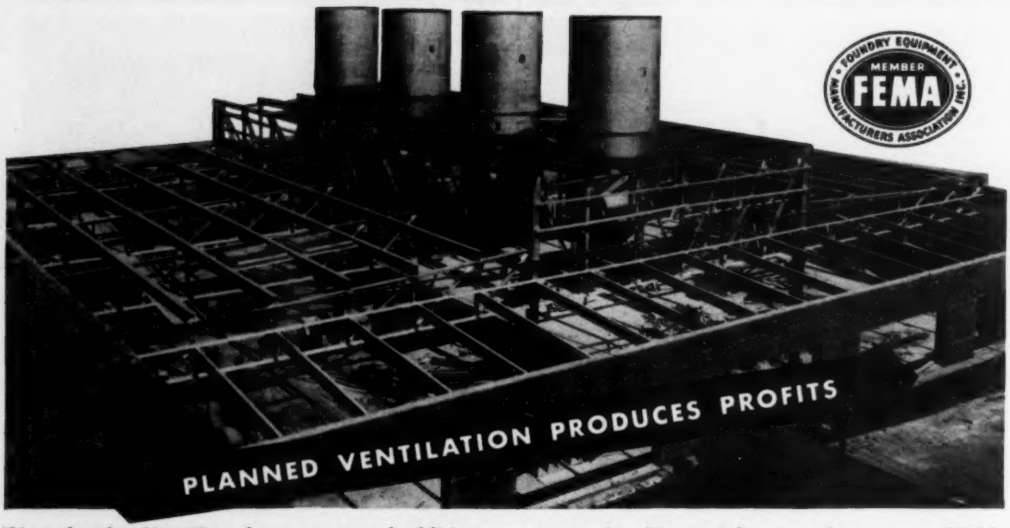

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Nodular graphite

A184 . . "On the Formation of Nodular Graphite in Cast Iron," A. Wittmoser, *Giesserei*, Vol. 38, September 1951, p. 475, and Vol. 38, November 1, 1951, pp. 572-577. (In German)

In a microscopic study of the formation of nodular-graphite cast iron, a peculiar microstructure history is revealed, of which the main features are: (1) the early destruction, due to the presence of Mg, of crystal embryos that would otherwise favor the growth of ordinary graphite flakes; and (2) a liquation process resulting in the formation of large spheroidal crystals of solid solution in the center of which nodular graphite is segregated after the solidification. The effect of this mechanism on various properties of nodular-graphite cast iron, and its bearing on the general problems of graphite segregation, are discussed.

Nodular cast iron

A185 . . "Report on Nodular Cast Iron," *SAE Journal*, Vol. 59, December 1951, pp. 23-24.

The properties of nodular cast iron are compared with those of gray iron, malleable and pearlitic malleable irons, and steel castings. The mechanical properties of nodular iron have been found to be superior in many instances, with machining costs often lower.

Cast iron properties

A186 . . "Physical and Mechanical Properties of Cast Iron," W. Leighton Collins, *Mechanical Engineering*, Vol. 73, December 1951, pp. 979-982.

A brief outline is presented of the physical and mechanical properties of cast iron, based on "Engineering Properties of Cast Iron," published by A.F.S. These properties, including tensile strength, yield strength, nodulus of elasticity, and endurance limit, are discussed from the points of view of present and needed knowledge.

Non-destructive testing

A187 . . "Fluoroscopic Inspection of Light Metal Castings," J. G. Schneeman and T. E. Piper, *Metal Progress*, Vol. 60, November 1951, pp. 93-96.

A comparative study was made of fluoroscopic and 25% x-ray inspection. It was revealed that the former test detected more defective castings than the latter. The opinions of those conducting the study favor the fluoroscopic test for screening inspection, with a radiographic test for questionable castings.

Making medium molds

A188 . . "Simplified Procedures in Mould Making for Medium-Sized Castings," A. Cappon, *Metalen*, Vol. 6, December 1951, pp. 441-447. (in Dutch)

A technique hitherto used for large castings only is extended to medium-sized ones. By making molds in which only the layer that comes into contact with the molten metal is exchanged between individual castings, considerable economy in material and handling is realized. Especially convenient in casting pieces with surfaces of revolution such as cylinder linings, the method can also be used for more complicated forms. Cylindrical shapes are obtained in two horizontal halves, the joint facing upwards in the mold of each half. Both loam and cement sand can be employed.

Compensating for poor coke

A189 . . "Coke Charge and Coke Quality for Cupola Melting," W. von Preen, *Gjuteriet*, Vol. 41, December 1951, pp. 183-185. (In Swedish)

Difficulties in obtaining good-quality fuel for cupolas oblige foundrymen to use second-rate coke which has the defect of showing rather high CO contents in the gases. The amount of losses thus incurred can be reduced by increasing the blast and reducing the proportion of iron in the charge.

Si and Al in brass

A190 . . "Contribution to the Study of Brass used in Casting," M. Cirou and P.-J. Le Thomas, *Fonderie*, Vol. 71, December 1951, pp. 2715-2728. (in French)

A study was made of the effect of the presence of Si and Al on the pouring qualities of brass, and of the concomitant changes in mechanical properties, structure, and porosity of such alloys. It was found that the presence of Si and Al augments porosity in the product while improving the alloy's behavior during casting.

Globular Graphite Theory

A191 . . "A Theory of Globular Graphite Formation in Cast Iron," Ishiro Mitaka, *Reports of the Casting Research Laboratory*, No. 2, 1951, pp. 1-4.

This theory attributes the globularization of graphite in iron to surface tension. Some substance adsorbed on the surface of the graphite is assumed to cause a large enough tension to cause the globular form.

Improving alloys

A192 . . "Improvement of Aluminum-silicon Alloys," Louis Grand, *Fonderie*, No. 69, October 1951, pp. 2625-2635 (In French)

Methods of improving the structure and mechanical properties of Al-Si alloys through addition of sodium and sodium fluoride are critically examined. Temperatures neighboring that of the foundry operation are recommended. A study is also made of treating hyperciliferous alloys with copper phosphite.

Using cupola gases

A193 . . "Composition and Utilization of Top Gases from a Small Cupola," K. Roesch, *Giesserei*, Vol. 38, October 4, 1951, p. 526. (In German)

The author offers several critical remarks on a paper by Chretien-Horand (*Giesserei* 38:275-276, 1951), in which experiments on the use of small-cupola gases for the heating of a drying oven were described. Analyses reported by that author show a very low content of CO (1%, with 16.6% CO_2), whereas data published by several other investigators are 13-10% CO and 13-18% CO_2.

Iron alloy components

A194 . . "Thermal Durability of Cast Iron and the Effect of Various Alloy Components," H. Timmerbeil, G. Clas and O. Mattern, *Giesserei*, Vol. 38, September 1951, p. 482, and Vol. 38, October 4, 1951, pp. 523-526. (In German)

Experiments dealing with the influence of P, Si, Al, and C as alloy elements on the scale-forming properties of cast iron are reported. Heating tests of 1000-hour duration showed particularly good thermal durability for an alloy containing 1.85% C, 6% Si, 0.6% Mn, 0.6% P, 4% Al, and about 0.2% Ti. The advantages and possibilities of industrial development of aluminum-silicon alloys as temperature-resisting materials are emphasized.

Vermiculite

A195 . . "Applications of Vermiculite in the Foundry," *Engineer and Foundryman*, Vol. 16, October 1951. For Ferrous and Non-Ferrous Castings, G. Butler, pp. 59, 61. For Steel Castings, A. Hirst, p. 61.

Experience has shown that vermiculite makes an excellent mould wash. It has also been used as a core and chill wash and as a feeding flux for non-ferrous castings. Still another application of vermiculite is on filter screens for non-ferrous castings. Its insulation properties are also particularly useful, as in the case where one portion of a casting must be case-hardened while the remainder is kept soft. Other uses include serving as an insulating

cover of the metal in lip-pouring ladles, and covering cast-iron roof plates of drying stoves.

Test for Cast Iron

A196 . . DETERMINE GRAPHITIZING TENDENCY. "Testing the Temper of Castings," *Journal d'informations techniques des Industries de La Fonderie*, no. 29, June 1951, pp. I-VI.

A brief shop test which indicates, at the moment of casting, the tendency toward graphitization of the metal; that is, of the structure, taking into account its average thickness. The test is used to control the regularity of production with the aid of chemical analysis and micrographic examination. The discussion includes a description of the test, as applied to specimens having four different silicon contents; a description of how the test is applied; and an interpretation of the results of the test.

Close Tolerance Casting

A197 . . PROCESS SELECTION FACTORS. A. A. Feldmann, "Microwave Components: Precision Castings Vs. Electroforming," *Materials and Methods*, vol. 34: (no. 1), July 1951, pp. 70-72.

Various methods of precision casting and electroforming are used in the manufacture of waveguide components. The process used depends upon a number of factors, including the exact shape of the waveguide, tolerances that must be held, and the number of pieces to be made. The processes discussed include die casting, investment casting, mercasting, and electroforming using both expendable and permanent mandrels.

Cylinders for Rolling Mills

A198 . . HOW TO CHOOSE. J. Neuville "Rolling Mill Cylinders," *La Fonderie Belge*, no. 4, April 1951, pp. 82-97; no. 5, May 1951, pp. 106-121. (In French)

A discussion is presented on the choice of cylinders for rolling mills, the cylinders being classified according to quality, usage, and the type of mill. The types of cylinders considered include sand-cast gray iron, gray iron cast in a chill mold, tempered cylinders, and compound or composite cylinders. They are also classified according to the mechanical and thermal stresses to which they are subjected.

Among the types of mills considered are blooming mills, merchant mills, heavy, medium and thin sheet mills, and cold mills.

Centrifugal casting

A199 . . "Centrifugal Casting of Ferrous Metals," C. K. Donoho, *SAE Journal*, Vol. 60, No. 1, January 1952, pp. 60-67.

Centrifugally cast parts are no better than equally-sound statically cast parts, but the method of production is such that porosity, shrinkages, blow-holes, and non-metallic inclusions are eliminated. The effects of the spinning speed and diameter of mold are discussed from a mathematical basis. Molds may be either of sand or metal, depending on the type and quantity of the casting produced. Steel, gray iron, malleable iron, and nodular iron have all been successfully cast by this method.

Furnace casts

A200 . . "Induction and Gas Furnace Melting Costs Compared," S. C. Parker, *Iron Age*, Vol. 168, No. 26, December 27, 1951, pp. 62-65.

The low-frequency induction furnace is more costly to install and operate than the conventional gas furnace, but temperature control is better and working conditions around the furnace are cooler. The turbulence produced by an induction furnace prevents non-metallics from settling out, but at the same time keeps the molten alloy homogeneous. Gas furnaces are more adaptable, though in some cases burner input has been geared to foundry rather than diecasting practice. A new type of gas furnace offers automatic operation.

American Foundrymen's Society introduces

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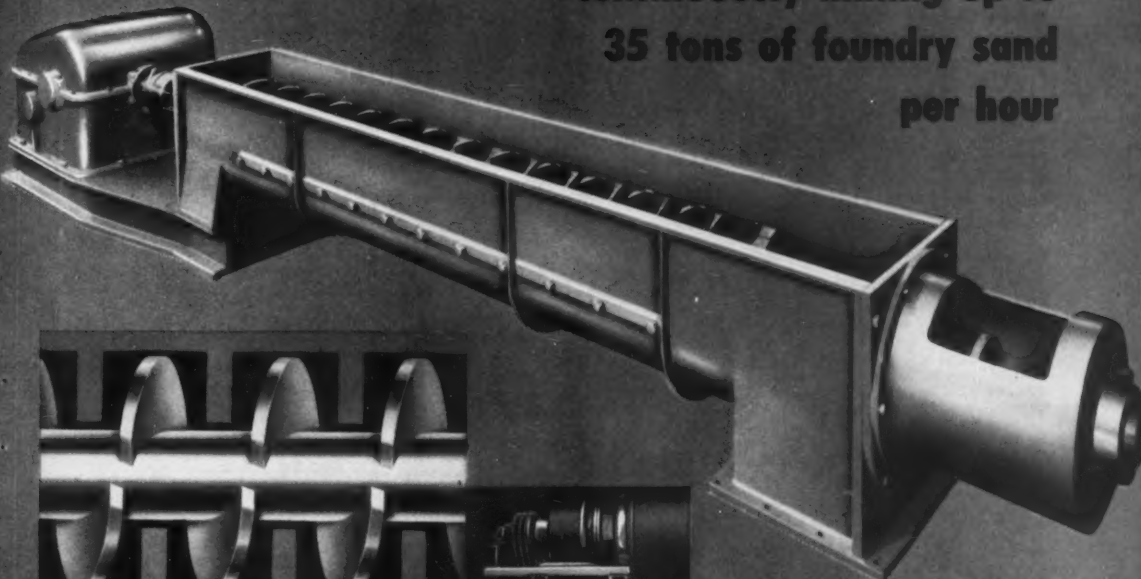
Baker Perkins Ko-Kneader

(LIST SYSTEM)

an efficient new unit for continuously mixing up to 35 tons of foundry sand per hour



B-P Ko-Kneader in operation handling foundry sand

With revolutionary Baker Perkins Type M List System Ko-Kneaders, continuous mixing of foundry sand becomes a highly practical operation. Essentially, the Ko-Kneader is a mixing worm revolving as well as reciprocating in a trough provided with kneading teeth in such a way that the mixing worm works as a single mixing machine with each tooth. The repetition of this operation, as the sand moves along the trough, completes the mixing and mulling. Baker Perkins Ko-Kneaders save considerable mulling time and also help to improve casting quality because the intense mixing action blends the sand uniformly and thoroughly. Baker Perkins Ko-Kneaders are ruggedly built for long life and dependable service. When used with specially designed Baker Perkins Feeders, operation of the Ko-Kneader is almost entirely automatic, resulting in substantial savings in labor costs. Consult a Baker Perkins sales engineer or write today for complete information.

BAKER PERKINS INC. foundry equipment sales • saginaw, michigan

AFS Introduces

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Emil Louis Krejci, Jr.
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James A. Smith

University of Michigan

Kerim Abdullah Ates
Peter Lardner
Charles Milles Hammond
Frank L. Sampson
Robert J. Hennig

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Metropolitan Chapter foundrymen snapped by Chapter Photographer John Bing, Metropolitan Refractories Corp., at the International Foundry Congress & Show were, from left: William T. Bourke and Thomas Woods, American Brake Shoe Co.; Chapter Chairman J. S. Vanick, International Nickel Co.; and Overseas Visitor Roman Chavy of Seine, France. Fred Baker and A.F.S. Past National Director Horace Deane of American Brake Shoe Co. Al Skinner and George Lloyd of Sachs-Barlow Foundries, Inc., D. S. Yeomans of George F. Pettinos, Inc., and William Matts of Sachs-Barlow Foundries, Inc.

chapternews

Washington

FRED R. YOUNG
E. A. Wilcox Co.

Triple feature program headlined the March 20 meeting, held at the Gowman Hotel, Seattle. Opening the meeting was a talk by E. D. Boyle, Puget Sound Naval Shipyard, Bremerton, Wash., on *"Use of Perlite in Foundry Sand."*

Next came a talk by A.F.S. National Director A. M. Ondreyco of Oakland, Calif. on highlights of the recent meeting of the A.F.S. Board of Directors.

Principal speaker of the evening was Hiram Brown, Solar Aircraft Corp., Des Moines, Ia., who discussed various methods of melting light metals.

Chesapeake

JOSEPH O. DANKO. JR.
Arlington Bronze & Aluminum Corp.

Friday, April 25, was the date, and the Engineer's Club, Baltimore, the place for the Chapter's regular monthly meeting.

The coffee talk was delivered by Arthur Hungerford, an official of the Maryland Civil Defense, who spoke on safety precautions in the event of an atomic war.

The main speaker, W. A. Morley, Olney Foundry Div., Link-Belt Company, Philadelphia, spoke on *"How to Start to Mechanize a Small Foundry"*.

The primary reason for mechanization, Mr. Morley stressed, is to make the work of each employee more effective. A mechanized system, particularly in a jobbing foundry, must be flexible to take on all sizes of work.

In planning, a foundry must first put on paper all the quantities, ranges, and immovable objects (cupolas, compressors, etc.) involved. Then a master plan must be formed and followed strictly, even though only a few items may be purchased at one time.

In closing, Mr. Morley said that proper re-arrangement of equipment can greatly increase foundry efficiency.

Detroit

R. GRANT WHITEHEAD
Claude B. Schneible Co.

Foundrymen from 12 nations, members of the International Study Tours held in connection with the International Foundry Congress, were guests at the April meeting.

The technical session got under way after a fine dinner on the subject of *"Castings versus Patterns."* Speakers were drawn from our hometown pool and included Alexander A. Andrews, Pontiac Motor Division, GMC; L. H. Kinney, Chrysler Corporation; and H. G. McMurray, Ford Motor Company. Many questions were raised by members of the chapter and the foreign delegation.

Metropolitan

W. T. BOURKE
American Brake Shoe Co.

April Meeting featured a talk on *"Cupola Reactions, Acid and Basic"* by Sam F. Carter, American Cast Iron Pipe Company, Birmingham. Technical Chairman was W. T. Bourke, American Brake Shoe Co.

Mr. Carter was one of the first in this

Proudly holding certificates attesting to completion of the apprenticeship course of the St. Louis Patternmakers' Joint Apprenticeship Committee in a ceremony held in connection with the A.F.S. St. Louis District Chapter's May 9 meeting are, from left: John Burkholder, Jr., Marvin Henke, Warren Hey and Curtis Tucker. Background, left to right, are the men responsible for planning and carrying out the course: Paul E. Retzlaff, Walter Zeiss, Edward Belton, St. Louis District Chapter Chairman Ralph M. Hill; C. E. Rutledge, F. W. Burgdorfer, chairman, St. Louis Patternmakers Joint Apprenticeship Committee; Hal Gilker, and J. A. Flavin, president, St. Louis Assn., Patternmakers League.

country to experiment with the basic-lined cupola, and his researches have contributed greatly to present day knowledge of cupola reactions.

The speaker pointed out that basic operation could be used to advantage by permitting the use of higher percentages of steel and cast scrap and the use of poorer quality coke. He emphasized, however, that basic operation required more careful supervision and technical control than acid melting, and in many cases would not be economical.

Central Illinois

G. F. LLOYD

Brass Foundry Co.

April 7 meeting, held at the American Legion Home, Peoria, began with Technical Chairman J. J. Shellabarger, Wagner Malleable Iron Co., Decatur, Ill., introducing the speaker, W. R. Jaeschke, Whiting Corp., Harvey, Ill. Mr. Jaeschke spoke on proper handling, charging and melting of malleable iron in various types of furnaces, and showed slides illustrating different furnaces. An interesting discussion period followed.

Saginaw Valley

ROY S. DAHMER

Eaton Mfg. Co.

Much interest was shown in the April 3 meeting when W. W. Levi, Lynchburg Foundry Co., Radford, Va., spoke on *"Operation of a Basic-Lined, Water-Cooled, Hot Blast Cupola."* The speaker was introduced by Technical Chairman Kenneth Priestley, Vassar Electroloy Co.

Mr. Levi described design features of the basic-lined, water-cooled cupola, now in use at Lynchburg's Radford foundry. Some of the features stressed by the speaker were: tube-type water coolers used in the melting zone; water-cooled copper tuyeres; external water cooling of the shell around and below the tuyeres; use of magnesite and carbon brick in constructing the tap hole; and use of an externally-fired air heater to preheat the blast. He also outlined effects of varying the air blast temperature.

Quad City

ERIC WELANDER

John Deere Malleable Works

George Anselman, Beloit Foundry Co., Beloit, Wis., was the principal speaker at the April 21 meeting, held at the Fort Armstrong Hotel, Rock Island, Ill. Some 150 foundrymen and their guests turned out to hear Mr. Anselman.

The speaker dealt primarily with casting defects produced by molding sand and core sand. He emphasized

Michigan State College Student Chapter Member Bruce Harding shown with the souvenir aluminum ashtrays he designed for distribution at MSC's Third Annual Student-Industry Banquet, April 21, when the college was host to Michigan founders.

Head table at the April meeting of Central New York Chapter included, left to right: Harold Boardman, General Electric Co.; William T. Bean, Jr., Detroit foundry consultant, evening's speaker; Chairman William D. Dunn, Oberdorfer Foundries, Inc.; Donald J. Merwin, Oriskany Malleable Iron Co.; Charles Esgar, Foundry Educational Foundation, Cleveland; Past Chapter Chairman Theodore Hook; and Peter E. Kyle, Cornell University, Ithaca, N. Y.

This table of members and visitors at Saginaw Valley Chapter's April 3 meeting included, clockwise from lower left: Fred Walls, International Nickel Co.; Jack Smith, Sr., Chevrolet Gray Iron Foundry, GMC, and Jack Smith, Jr.; James H. Bernard, Eaton Mfg. Co.; Howard Wilder, Vanadium Corp. of America; Ernest L. Waterhouse, Eaton Mfg. Co.; Marshall Chamberlain, Dow Chemical Co.; A.F.S. National Director Harry W. Dietert, Harry W. Dietert Co.; Harry E. Gravlin, Ford Motor Co.; and Harold McMurray, Ford Motor Co.

More than 100 foundrymen of the Birmingham District Chapter and students of the University of Alabama Student Chapter enjoyed a buffet supper in the University Foundry at a joint meeting of the two chapters on April 18.

the importance of examining all circumstances that enter into the production of scrap castings. Control of sand grain size distribution was also discussed, and the speaker recommended the use of a three-screen sand in preference to those possessing wider distribution.

He also outlined the control method used in his foundry, where castings ranging in size from a few ounces to forty tons are cast in the same base sand.

Other factors, such as gating, pouring time, cooling rates and plain carelessness were also suggested as causes for casting defects. The talk was illustrated with a series of excellent slides. The large and enthusiastic audience reflected the popularity of both the speaker and the subject.

Clifford Erickson, Superintendent of Frank Foundries, Moline, served as technical chairman.

Robert Lovett of Deere & Company's Export Department, the "coffee talk" speaker, told of his trip to South Africa, and showed colored slides of his travels.

E. D. Boyle of Puget Sound Naval Shipyard, Bremerton, Wash., speaking at Washington Chapter's March 20 meeting on "Use of Perlite in Foundry Sand."

Birmingham District

J. P. MCCLENDON

Stockham Valves & Fittings

Joint meeting of the Birmingham District Chapter and the A.F.S. University of Alabama Student Chapter was held in the University Foundry in April.

In conjunction with the meeting, Frank S. Brewster of the Harry W. Dietert Co., Detroit, conducted an all-day Sand School at the University. No admission or registration fee was charged for the clinic, the second to be held in Alabama.

More than a hundred foundrymen gathered at the University to inspect its foundry and other metallurgical department facilities. Attesting to the cleanliness of the school foundry was its use as a dining room for a buffet supper. Credit for the success of the inspection tour and supper goes to Chester Wright and Warren Jeffery of the faculty and to all members of the Student Chapter.

Chapter Chairman Charles K. Donoho, American Cast Iron Pipe Co., Birmingham, conducted a short Birmingham District chapter meeting after dinner, during which the nominating committee submitted a slate of officers for the 1952-53 season.

Foundrymen from Georgia, Alabama, and Tennessee attended. The Foundry Educational Foundation was represented by Charles Esgar, FEF Staff Assistant.

Michigan State College

B. L. HARDING

MSC Student Chapter was host Michigan foundrymen April 21 at its Third Annual Student-Industry Banquet, held on the college campus.

Evening's highlight was a talk by A.F.S. National Director Fred G. Sefing, International Nickel Co., New York, on *"New Developments in the Cast Metals Industry."* Mr. Sefing's talk emphasized the way in which these developments came into being. In closing, Mr. Sefing gave students two important words of advice—"Think Fundamentals."

A souvenir miniature crane ladle, cast in aluminum, was given to each visiting foundryman.

Southern California

ALFRED A. GRANT, III

Grant & Co.

April 11 meeting, held at the Rodger Young Auditorium, Los Angeles, began

Getting a preview of talk slides at Central Illinois Chapter's April 17 meeting are, left to right: Technical Chairman J. J. Shellabarger, Wagner Malleable Iron Co.; Henry Felten, Peoria Malleable Castings Co.; and Speaker W. R. Jaeschke, Whiting Corp., Harvey, Ill. (Photo: Fred Brosmer, Caterpillar Tractor Co.)

with an excellent steak dinner, immediately followed by presentation of awards in the chapter's Apprentice Contest.

Following the awards was a talk by Donald M. McCutcheon, Ford Motor Co., Dearborn, Mich., on "*Non-Destructive Testing.*" The speaker pointed out that in order to obtain a uniform means of interpreting test results, proper equipment and personnel must be employed. The essentials of testing were described as mechanical, physical, and geometric.

Various modes are used, he said, among them the light test for visual inspection; penetrating radiation by means of x-ray; use of radio-active isotopes; electrical and electro magnetic processes. All serve their purpose, but must be properly applied in order to correctly determine results, he concluded.

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At the speakers' table at Oregon Chapter's April meeting were, left to right: Chapter Director Henry Weiss, Mobilift Corp.; Vice-Chairman William M. Halverson, Electric Steel Foundry Co., and Speaker Donald M. McCutcheon, Ford Motor Co., Dearborn, Mich. Photo by Norman Hall, Electric Steel Foundry Co.

Central New York

RALPH J. DENTON

R. J. Denton Co.

April 4 meeting, designated "Engineers' Night," was one of the largest of the year, with 151 foundrymen attending. Evening's arrangements were made by Prof. Peter E. Kyle of Cornell University.

The Sand and Test Laboratories at the University were open for inspection and students and instructors were on hand to give complete detailed explanations of all equipment.

Speaker of the evening was W. T. Bean, Jr., of Detroit, whose subject was "*Good Castings—On Purpose.*" His talk was very timely in that he covered basic problems in design of castings, proper relationship of design to product, pattern design and its effects on the finished product. Many foundrymen made it a point to have as their guests various design engineers and it is certain that Mr. Bean's comments were very much appreciated by both foundrymen and engineers.

Mr. Bean stressed the importance of integrity of foundry management and personnel.

Mr. Bean stated that it is a foundry's responsibility to make certain that all castings shipped are up to standard. Furthermore, he said, all castings should be scrapped if questionable, so as not to run the chance of failures in the field. The low percentage of scrapped castings in many instances means too many castings pass that should be scrapped, he concluded.

Central Ohio

WILFRED H. WHITE

Jackson Iron & Steel Co.

Excellent turnout at the April 14 meeting was indicative of the interest of foundrymen in cutting down casting defects, subject of a talk by George Anselman, Beloit Foundry Co., Beloit, Wisconsin.

Mr. Anselman spoke on well-known as well as less-common defects, including cracks, shrinks, blows and hot tears, their basic causes and remedies. His talk was well illustrated with some very good slides of the defects under consideration.

A lively discussion period followed, during which the members questioned Mr. Anselman on their current casting defect problems.

University of Alabama

JACK E. BOLT

Student Chapter Chairman

On Friday, April 18, the University of Alabama was host to foundrymen of the Southeastern area. During the day a Sand School was conducted by Frank S. Brewster of the Harry W. Dietert Co., Detroit.

The Sand School was held in the University foundry, with all conveyors and equipment removed to make room for classroom chairs. Following the school, the A.F.S. Student Chapter displayed sand testing, radiography, metallography, induction furnace melting and carbon determination equipment. The display was quite interesting.

In the evening, a buffet dinner was held in the foundry, followed by the annual joint meeting of the A.F.S. Birmingham District and University of Alabama Chapters. The dinner was arranged by students and served by wives of students and faculty members.

Central Michigan

R. H. DOBBINS

Albion Malleable Iron Co.

Regular monthly meeting, held at the Hart Hotel, Battle Creek, April 16, was well attended.

During the year, the chapter's Educational Committee, through the efforts of David Boyd, Engineering Castings, Inc.,

Approximately 60 foundrymen and their guests attended the April meeting of the Toledo Chapter to hear John Mescher, Unitcast Corp., speak on coreblowing.

Looking over an exhibit of educational activities sponsored by Central Michigan Chapter at the chapter's April 16 meeting were, from left: A.F.S. National Director Fred G. Sefing, International Nickel Co., New York, meeting speaker; Austen J. Smith, Michigan State College; and Central Michigan Chapter Educational Committee Chairman David W. Boyd, Engineering Castings, Inc.

Group of Penn State College Student Chapter members and instructors who met March 13 to hear John L. Shinn, Catalin Corporation (standing, second from left) speak on shell molding.

Marshall, introduced two new foundry courses at Battle Creek Vocational School.

Instructor Aten of Battle Creek and three of his most promising students, David Smith, Charles Jarfster and Robert Herwarth, were invited as special meeting guests. Mr. Boyd presented an interesting summary of the school's activities.

Guest speaker Fred G. Sefing, International Nickel Co., New York, discussed *"The Foundry's Responsibility for Training Young Men,"* in which he stressed the need for attracting good personnel, regardless of educational background. He also emphasized the need for well-organized training programs for both new and veteran employees in the foundry industry.

Twin City

J. D. JOHNSON

Foundry Products Div., Archer-Daniels-Midland Co.

More than a hundred members and guests attended the April 8 meeting to hear W. W. Levi, Lynchburg Foundry Co., Radford, Va., present a twin-bill program on *"Cupola Operation"* and *"Basic Cupolas."*

As outlined by Mr. Levi, primary needs for production of high-grade melts are hot iron, proper melting rate, and proper chemical composition.

Ignition of the coke bed, he stated, has much to do with how the first molten iron will turn out. When using kindling wood, generous amounts are necessary to start the coke bed. Oil, electric, and gas ignition are available and practical. The use of an extra limestone charge (three times normal) on top of the coke bed is very desirable to promote a fluid slag at the first part of the run.

Total carbon in the spout can be closely predicted, Mr. Levi said, by adding ½ the carbon in the metal charge to 2.4 per cent, then subtracting ¼ of the sum of the percentage of sulphur and phosphorus in the charge. Scrap of known analysis must be used

Here are the winners in the local apprentice contest conducted by the A.F.S. Northeastern Ohio Chapter and the Pattern Manufacturers Group, Associated Industries of Cleveland. Front row, left to right: Donald Siebert, Fred Fiorentini, Robert Perry, John Bolibrush, James Orban, William Pitcher, Lynn Northway, Raphael Lindsay and Donald Marinelli. Back row are men responsible for the contest, left to right: Steve Kelly, Eberhard Mfg. Co.; John Fintz, Asst. Superintendent of Schools, Cleveland; Frank Cech. Cleveland Trade School; A.F.S. National Director Vincent J. Sedlon, Master Pattern Co.; and James Goldie, Cleveland Trade School. Photo by Sterling N. Farmer.

and all charge ingredients must be carefully weighed.

Speaking on basic cupola operation, Mr. Levi cited three advantages: (1) better carbon pickup, (2) operation at lower sulphur content, valuable in producing nodular iron, and (3) ability to operate at higher temperatures.

Disadvantages, he said, are the basic cupola's need for air heated to 800 F or 1000 F, and the present high cost of basic refractories.

Oregon

NORMAN E. HALL

Electric Steel Foundry Co.

At its March meeting the chapter was privileged to have as its guests A.F.S. National Director A. M. Ondreyco, Oakland, Calif., and Hiram Brown, Solar Aircraft Co., Des Moines, speaker of the evening.

Pointing out the importance of the A.F.S. membership program, Mr. Ondreyco said the chapters should do everything possible to meet the membership quota established by national headquarters.

Speaking on *"Light Metal Foundry Practice,"* Mr. Brown gave the group a comprehensive review of the aluminum and magnesium foundry practices and described the main types of melting equipment used, pointing out the importance of selecting the proper types of pots and crucibles used for these metals.

Since the melting cycles of aluminum and magnesium are different, the speaker discussed them separately, and completed his talk by describing metal handling and pouring procedures for these two metals.

Donald M. McCutcheon, Ford Motor Co., Dearborn, Mich., spoke at the April meet on *"Non-Destructive Testing,"* using slides to illustrate various types of testing, including mechanical, light or visual, chemical, thermo, penetrating radiation method, and electricity and magnetism.

While some of these methods are controversial, with the personal element entering into them very strongly, others are, he pointed out, coming into their own through the development of radioactive materials and the use of more delicate electronic instruments.

Penn State College

LOUIS C. HAEFNER

Advanced Foundry Student

March 13 meeting proved both interesting and educational. Subject of the meeting was the shell molding process, demonstrated by John L. Shinn of the Catalin Corporation.

Pattern and container for holding the sand and resin mixture used in Mr. Shinn's demonstration were made as a

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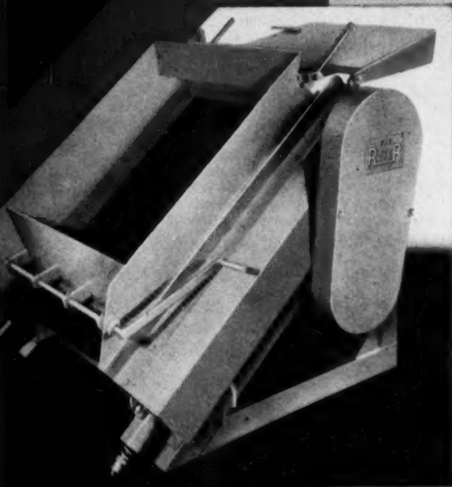
NOW AVAILABLE

60 to 100 Tons
of conditioned sand
PER HOUR
with the new ROYER Model "NYS"



The new Model "NYS" Royer Sand Separator and Blender was designed to handle the discharge from large mullers or for installation in sand handling systems having a conditioned sand requirement of 60 tons per hour or more. This model "NYS" Royer, the latest in the complete line of Royer sand preparation equipment, with its capacity of 60 to 100 tons of sand per hour (depending upon the type and temper of the sand to be conditioned) is the answer to the many demands we have received from Royer users for a machine of larger capacity.

The new Model "NYS", like all Royer Sand Separators and Blenders, gives foundrymen complete 6-point sand preparation: refuse removal, thorough blending and mixing, lump breaking, increased permeability, even moisture distribution and double aeration.

Its sturdy construction with heavy welded underframe and base is assurance of many years of continuous service under the most abusive operating conditions. Write for complete details on this latest labor saving, production increasing unit.

SPECIFICATIONS

Capacity.. 60 to 100 tons per hour depending upon type and temper of sand

Overall Dimensions............Length: 54"
Width: 56"
Height: 54"
Belt Width: 36"

Approximate Weight............2000 pounds

Power............10 horsepower

Construction....Heavy welded angle frame and base

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.
155 PRINGLE ST., KINGSTON, PA.

chapter news

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project by FEF Scholarship Student Walt Yahn.

The history of the shell molding process is of considerable interest, as outlined by Mr. Shinn. The process was in use toward the close of World War II by the Germans, who called it the Croning Process, chiefly for casting hand grenades. The process came to the United States through the reports of technical teams touring Germany on the lookout for new industrial processes.

In this country, since the war the Navy has done considerable experimental work with shell molding, but its use commercially has been somewhat retarded by questions on patent rights.

Size of the molds is generally limited to 50 lb. castings. However, there is no limitation upon casting weight except possible difficulty in handling. The pattern that Yahn made for the demonstration is a small ash tray about 6 inches in diameter.

Tolerances possible with the "C" process are quite impressive. Tolerances of 0.003 in. per lineal inch are easily reached. This compares very well with investment casting.

The metal pattern plate must be capable of resisting distortion, as it is to be continually heated to temperatures considerably above 600 F. High temperature alloy cast iron or graphitic steels are preferred, according to technical journals, for the pattern plate. Gating follows the usual green sand procedure. It is apparently better to gate from the bottom if possible.

Other Organizations

New England Foundrymen's Assn.

MYRON DEHOLLANDER

General Electric Co.

More than 125 members and guests attended the April 9 meeting, held at Boston's Puritan Hotel.

A short business meeting was conducted by President Frank Elliot. T. Fitzgerald of the Draper Corporation presented the Association with an appropriate bell and striker, explaining that it should serve well in the future to call our monthly meetings to order.

Dix Chandley and R. Chihoski of the MIT. Student Chapter of A.F.S. were introduced.

After dinner, A. E. Blake, General Electric Co., Foundry Department, Schenectady, reviewed his recent trip through many European Foundries. Mr. Blake, a graduate of Rensselaer Polytechnic Institute, has been associated with foundries for better than 10 years and his observations were therefore interesting, descriptive, and educational.

AFS Introduces

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Outside of Chapter

Robert D. Barker, Pres., *Rollstone Foundry, Fitchburg, Mass.*
John J. Buchanan, Asst. Supt., *Graniteville Foundry Co., Graniteville, Mass.*
J. H. Davis, Pres., *Advance Mach. & Mfg. Co., Beckley, W. Va.*
Alfred C. Kageats, Supt., *Princeton Foundry & Supply Div., Princeton, W. Va.*
William A. Kennedy, Supv., of Products, *Grinnell Corp., Providence, R. I.*
James T. O'Connor, *Silverstein & Pinsof, Pittsburgh, Pa.*
James E. O'Neill, Pattern Shop Fmn., *Hartford Electric Steel, Hartford, Conn.*
Frank H. Olson, Foundry Engr., *Bullard Co., Trumbull, Conn.*
Ivan B. Troop, Fdy. Fmn., *General Electric Co., Boxford, Mass.*

International

Australia

Alan J. Brown, Senior Tool Engr.-Fdy. Operations, *General Motors Holden's Ltd., Werribee.*

Brazil

Murilo de Oliveira Marcondes, Tech. Dir., *Industria Met. N. S., Aparecida, S. A., Sao Paulo.*

England

William James Driscoll, Gen. Mgr., *Cupodel Limited, Northfield, Birmingham.*

India

K. C. Sen, B. Sc. (Met.), Assistance Engr., *M/S Burn & Co., West Bengal.*

Italy

Dacco Aldo, Owner, *Liasa, Milan, Italy.*
Dr. Abignente Berardo, Chemist, *Fonderia Vittoria, Torino, Italy.*
Dr. Corrado Galletto, *Centro D'Informazions del Nickel, Milano, Italy.*

Israel

Felix Belkin, *Mechanical & Electrical Engr., Tel Aviv, Israel.*
Chanan Ophir, Supt., *Israel Railroad Foundry.*

Japan

Tsngiyoshi Matsimra, Mgr. of Fdy. Shop, *Komatsu Manufacturing Shop, Futsu-Machi, Komatsu City, Ishikawa-Ken.*
Kanshichi Tanaka, *Kubota Iron & Machinery Works, Sumiyoshi Asaka.*
Kohei Taniguchi, Dr. Eng. Director, *Chita Plant, Kawasaki Steel Corp., Handa City, Aichi Pref.*
Kokichiro Toyoda, Engr., *Toyoda Automatic Loom Works, Ltd., Aichi-ken.*
Nobutaka Yamamoto, *Fuso Metal Industry, Ltd., Osaka.*
Hotta Yoshiyuki, Director & Chief Engr., *Kobe Cast Works, Ltd., Kobe.*

Sweden

Sven Erland Fredman, Fdy. Engr., *SKF Ball Bearing Co., Katrineholm.*

Switzerland

Walter H. Sulzer, Mgr., *Precision Fdy. Div., Sulzer Brothers, Ltd., Winterthur.*

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F. Carter, American Cast Iron Pipe Co., Birmingham, as co-chairman.

This session was devoted to talks on the basic cupola—the first from the viewpoint of a refractories supplier, and the second from the viewpoint of the foundryman.

M. W. Demler, Harbison-Walker Refractories Co., Pittsburgh, presented the first paper, "*Basic Refractories for Cupola Service.*" Second paper was given by H. M. Kraner, Bethlehem Steel Co., Bethlehem, Pa., on "*Refractories for the Basic Cupola.*"

Mr. Demler described lining and patching the basic cupola and recommended placing cardboard strips between bricks around the perimeter as well as between vertical joints to accommodate the high expansion cf basic refractories.

Mr. Kraner reviewed the basic practice of several cupola experts in England and the United States and compared it with blast furnace practice and theory.

Education dinner

Top event of Tuesday's program was the International Education Dinner held at 7:00 p.m. in the Hotel Traymore's Belvedere Room. A.F.S. President Elect I. R. Wagner, Electric Steel Casting Co., Indianapolis, Ind., presided. Vice-President Elect Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., was co-chairman.

Principal speakers were Noel P. Newman, past president, Institute of British Foundrymen, Newman Hender & Co., Gloucester, England, and IBF Secretary Tom Makemson, Deansgate, Manchester, England. Mr. Newman reviewed the benefits of the productivity team visits to the United States. The United Kingdom, he said, needs to devote more time to foreman training.

Mr. Makemson cited the increasing difficulty in obtaining apprentices experienced in the United Kingdom. Promotional efforts are concentrated on local education officers, and promotional booklets are extensively used, he declared. In describing the National Foundry College, he said the school had been patterned after the French foundry school in Paris.

Other overseas speakers at the International Education Dinner were: Dr. D. R. Malhotra, Bombay; Prof.

Ove Hoff, Denmark Institute of Technology, Copenhagen; and Dr. Marcel Ballay, Centre d'Information du Nickel, Paris.

Wednesday, May 7, began with opening of the Foundry Show and registration at 9:00 a.m. First technical session, on Gray Iron, began an hour later with A. P. Gagnebin, International Nickel Co., New York, presiding, and Richard Schneidewind, University of Michigan, as co-chairman.

C. C. Reynolds, Massachusetts Institute of Technology, presented *"Mechanical Properties of Spherulitic Graphite Cast Iron"* co-authored with Howard F. Taylor, MIT. Mr. Reynolds described experiments conducted to determine mechanical properties of magnesium-inoculated nodular iron and described a foolproof inoculation method.

"A Solidification Dilatometer and Its Application to Gray Iron" by R. P. Dunphy and W. S. Pellini, Naval Research Laboratory, Washington, D.C. was presented by Mr. Dunphy. He described dilatometer measurements of gray iron solidifying in various types of sand molds. Feature of the dilatometer was a silica tube through the side of the mold which followed casting wall movements during solidification.

Final session paper, presented by Henton Morrogh of the British Cast Iron Research Association, Alvechurch, Birmingham, England, dealt with *"Influence of some Residual Elements, and Their Neutralization, in Magnesium-Treated Nodular Iron."* He showed how small amounts of cerium can be used to overcome the ill effects of titanium, lead, bismuth, antimony, aluminum, and copper and told of using a nickel-magnesium-cerium alloy to add both magnesium and cerium to nodular irons.

Harry W. Dietert, Harry W. Dietert Co., Detroit, was chairman of the 10:00 a.m., May 7, Sand session. E. C. Zirzow, Werner G. Smith, Inc., Cleveland, was co-chairman.

Progress report of the A.F.S. Sand Division's Committee 8-J (Physical Properties of Iron Foundry Molding Materials at Elevated Temperatures) was presented by Committee Chairman Victor M. Rowell, Archer-Daniels-Midland Co., Cleveland, on the subject of *"Veining Tendencies of Cores."* Studies, limited to iron castings, were made at the laboratories of the Harry W. Dietert Co., Detroit, using test castings made at the University of Michigan. It was established, Mr. Rowell said, that

veining defects can be eliminated by proper selection of base sands, binders, pouring temperatures, degree of ramming and baking, and percentage of binders and sometimes moisture.

R. G. Thorpe, A. E. Riccardo, P. L. Widener and P. E. Kyle were co-authors of *"Steel Sands at Elevated Temperatures,"* a report on the A. F. S. Sand Division Research Project carried on at Cornell University.

Third session paper, dealing with *"Effect of Binders and Additives on Ductility in Molding Sands at Elevated Temperatures,"* was presented by R. E. Morey, C. G. Ackerlind and W. S. Pellini of the Naval Research Laboratory, Washington, D. C.

The Navy researchers adapted an automatic stress-strain recorder to a conventional sand testing dilatometer furnace. They found that compacted foundry sand follows Hooke's law and behaves as an elastic solid at loads below the elastic limit, undergoing plastic deformation or taking a permanent set at higher loads.

Steel session at 10:00 a.m., May 7 featured presentation of two papers and a third by title only. Heading the session was C. H. Lorig of Battelle Memorial Institute, with Charles Locke, Atlas Foundry & Machine Co., Tacoma, Wash., as session co-chairman.

Steel metallurgy

Sam F. Carter, American Cast Iron Pipe Co., Birmingham, speaking on *"Steel Desulphurization with Injected Carbide,"* described a method whereby sulphur can be reduced in small acid electric heats from 0.085 to 0.045 per cent, 0.075 to 0.038, 0.030 to 0.019, etc., by injecting finely divided carbide into the furnace with inert gas. The method works in basic lined furnaces too according to data given by Mr. Carter.

Second session paper, *"Cutting with Ultra-High Purity Oxygen,"* by E. H. Roper and J. F. Kiernan, Air Reduction Sales Co., New York, told of experiments to determine effects of oxygen purities between 99.0 and 99.3 per cent on cutting and starting of cuts on steel plate, billets and cast sections. It was found that speed increases 2 per cent for every 0.1 per cent increase in purity, said Mr. Roper.

Official Exchange Paper of the Institute of Australian Foundrymen (New South Wales Division), *"Manufacture of Cast Edge Tools in Rotary Furnace Steel,"* was presented by title only due to late arrival of the paper. Authors were Gordon Keech,

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foundry tradenews

Aluminum Co. of America and **Bohn Aluminum & Brass Corp.** have been licensed to use a process for the molecular bonding of aluminum to iron or steel. Process was developed by the **Al-Fin Div., Fairchild Engine & Airplane Corp.**, Farmingdale, L.I., N.Y. The Al-Fin process makes it possible to combine the strength, hardness, and fatigue resistance of steel or iron with aluminum's light weight, superior heat conductivity, excellent bearing qualities, and ability to withstand oxidation.

Glidden Co., Cleveland, and **Bohn Aluminum & Brass Corp.**, Detroit, are engaging in joint research into titanium. Both companies are interested in the production of the pure metal, its compounds and alloys, and in the fabrication of ductile titanium and its alloys. The project is headed by W. E. McCullough, chief metallurgist for Bohn, and B. W. Allen, director of research for Glidden's Chemicals - Pigments - Metals Div. Work will be conducted at Bohn's laboratories in Detroit and at Glidden's laboratories in Baltimore.

Christiansen Corp., Chicago, announces the formation of its fourth wholly-owned subsidiary, **Titanium Co. of America.** New outfit will make wrought products of titanium, and will probably be located in East Chicago, Ind.

Basic Refractories Inc., Cleveland, has acquired the physical assets of **Sierra Magnesite Co. of Nevada.** It has also obtained a lease to mining claims adjoining its property at Gabbs, Nevada.

Cooper Alloy Foundry Co., Hillside, N. J., has developed an interesting approach to public relations. Called *Alloys in Cooperland*, their little book is aimed at "selling" stainless alloys in an amusing and painless way. Basis is the poem, "The Walrus and the Carpenter" from *Alice in Wonderland*.

Armour Research Foundation of Illinois Institute of Technology, Chicago, was recipient of a laboratory sintering machine donated by **Duncan Foundry & Machine Works**, Alton, Ill. **American Ore Reclamation Co.**, Chicago, assisted in the arrangements. Machine will be used for studies of lightweight aggregates for concrete, and in the treatment of finely divided ores.

American Smelting & Refining Co., Federated Metals Div., opened its Whiting, Ind., plant to 40 students from Purdue University on April 16. Trip was one of a series of plant visits sponsored by Federated in cooperation with colleges and universities desiring to incorporate practical studies in metallurgical courses.

General Metals Corp., San Francisco, has plans for building a new installation or making heavy steel castings and special steel ordnance castings. It will be erected in Oakland, Calif., adjoining General Metals existing steel castings plant. Building will cover over three acres at a cost of about $5,000,000. To be completed in 10 months, the addition will need 500 employees.

Dravo Corp., Heating Dept., Pittsburgh, has opened a new office in St. Louis, with Fred W. Schulte in charge. Address is 1110 S. Brentwood Blvd.

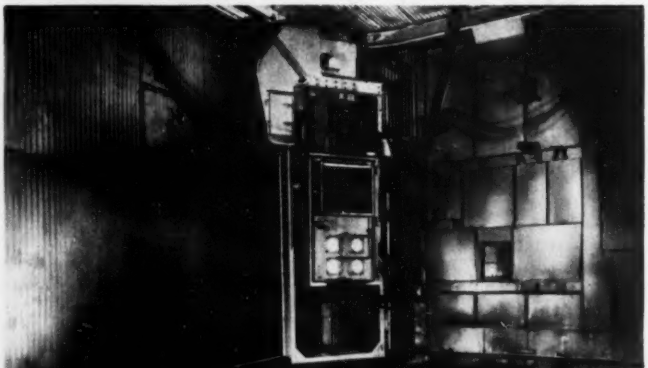
Hamilton Standard Div. of United Aircraft Corp. and **Bart Laboratories Co., Inc.**, Belleville, N. J., announce development of a synthetic rubber compound for establishing a bond between aluminum and nickel plate. Compound was developed by Hamilton Standard. Bond has an extremely high adhesion or tensile strength. It will stand up under a wide range of temperatures. Bond material is sprayed onto aluminum to the required thickness. After drying, the piece is then plated with nickel by conventional means.

Food Machinery & Chemical Corp., John Bean Div., suffered a $700,000 loss March 31 when its Belding, Mich., plant burned to destruction. The fire, which sent 40-ft flames leaping out every window, was blamed on a combustion explosion fed by coal dust from their next-door foundry.

National Research Corp., Cambridge, Mass., announces commercial production of vacuum-cast, gas-free metals. Production involves temperatures to 5000 F with pressures down to 1/1000,000 of an atmosphere.

Lynchburg Foundry Co., Lynchburg, Va., has created an advisory board to improve relations and methods inside the plant. Members of the board include H. H. Holland, Works Manager, Radford plant; C. W. McLennan, Personnel Director; L. C. McNeill, Asst. General Manager; J. B. Evans, Asst. Secretary and Auditor; W. R. Odor, Sales Manager, Pipe Dept.; T. W. Curry, Director of Manufacturing Research & Methods; H. W. Campbell, Works Manager, Lynchburg plant; W. W. Levi, Chief Metallurgist; Robert Rose, Asst. Purchasing Agent; and C. A. Glenn, Sales Manager.

American Refractories & Crucible Corp., North Haven, Conn., has appointed **Christy Firebrick Co.**, St. Louis, Mo., as sales distributors covering the states of Oklahoma, Missouri, Texas, Louisiana, and Arkansas.



Sandblasters at the Falk Corp., Milwaukee, now work from an air-conditioned cab. The cab is mounted on a carrier which moves along three sides of the cleaning room on a monorail. The cab also moves vertically in its frame. Turret-like action of the gun, coupled with this freedom of motion, allows the sand-and-water spray to reach all parts of the castings. Spent sand and water fall to the floor and are drained off for reclamation. The system replaces a conventional unit in which an operator in a rubber suit sprayed the castings by hand with a hose. Falk reports that work capacity has been tripled.

convention

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Keech Castings Pty., Ltd., A. T. Batty and W. M. Dummett, Institute of Australian Foundrymen, Sydney, Australia.

Inclusions received heavy attention at the Steel Round Table Luncheon held May 7 in the Embassy Salon of the Ambassador Hotel. The session was patterned after a style revived last year by the Brass & Bronze Division in which discussion topics are selected from lists distributed to the tables. Presiding was J. B. Caine, consultant, Wyoming, Ohio. V. E. Zang, Unitcast Corp., Toledo, Ohio, was co-chairman.

Gating and risering

Final session of the 1952 International Foundry Congress was held at 2:00 p.m., May 7, on Gray Iron, with J. S. Vanick, International Nickel Co., New York, as chairman, and T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa., as co-chairman. Both session papers dealt with gating and risering and were A.F.S. Gray Iron Division committee reports: *"Gating and Risering of Gray Iron,"* by W. A. Schmidt and H. F. Taylor, Massachusetts Institute of Technology, a progress report on the Gray Iron Division's research project; and *"Gating and Risering Terminology,"* by N. A. Birch, National Bearing Div., American Brake Shoe Co., Meadville, Pa.

Mr. Birch reported on the work of the Gating and Risering Committee in developing standard nomenclature for the various types of gates and risers. (This information has been circulated to chairmen and vice-chairmen of the various A.F.S. divisions and will be published soon.)

Mr. Schmidt summarized the fundamental research conducted on the Gray Iron Research Project to date and stated that a considerable amount of expansion occurs following pouring of a casting, that feeding of the riser used in the investigations stops while about 70 per cent of the metal is still liquid, and that cooling rates and/or gradients influence the type of shrinkage and degree of soundness in a casting.

At 4:00 p.m., May 7, the 1952 International Foundry Congress & Show closed its doors, ending one of the greatest and most successful gatherings of world foundrymen in the history of the industry.

Products . . .

continued from page 17

50 to 400. Advantages include fuel savings, longer burner life, faster heating, easy charging, less slagging, and unpluggable burners. Standard sizes are made in both stationary and tilting types. *Morrison Industries, Inc.*

608 Sand conditioner

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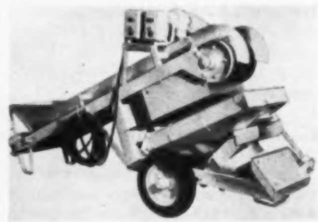

Conditioner (called "Magnerator") is designed for shovel loading and is built in two sizes, with capacities of 20 and 30 tons of sand per hour. *Beardsley & Piper, Div. of Pettibone Mulliken Corp.*

609 Electric lift truck

Improved Load-Mobile electric lift truck incorporates such new features as: high-low switch for easier maneuverability in close quarters; spring-mounted casters for increased stability; more ball bearings in control system for easier operation; heavy roller chain operation of brake; hydraulic

lifting mechanism in vertical position at front end of hood, where it is less likely to be damaged in transit over rough floors. Load-Mobile is available as a lift truck for conventional skid platforms; as a pallet truck for handling double-faced pallets; as a freight and pick-up truck; and as a tractor. *Market Forge Company.*

610 Oxygen generator

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Letters

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used carbon equivalent factor is used ($C + \frac{Si}{3} + \frac{P}{3}$). These effects must surely detract from the value of the results.

A further criticism must be made of Fig. 8 of the paper. To take an example, an iron of composition factor 2.4 at the temperature of its liquidus (2460 F) has a fluidity of 4 in. Similarly, an iron of composition factor 4.2 at its liquidus temperature (2030 F) has a fluidity of 11 in. This infers that there is a considerable degree of fluidity remaining at temperatures between the liquidus and solidus. In the cast of an iron of eutectic composition (for example, 3.5 per cent, C, 2.0 Si, 0.4 P, which has a fluidity composition factor of 4.2) the liquidus and solidus are coincident at the eutectic temperature. Surely it is erroneous to assume that this iron at its eutectic temperature has a fluidity of 11 in., which is equal to that at a temperature of 150 F above the liquidus of an iron of lower composition factor 2.4. As all the spiral lengths reported fall within the range 18½ to 28½ in., there is no experimental evidence for constructing a diagram showing a range of fluidity of 2 to 66 inches on the assumption of a straight line relationship between fluidity and pouring temperature. One would imagine that this Fig. 8 would be more neatly correct if the line representing 2 in. fluidity was drawn almost parallel with the liquidus temperature line and the other fluidity lines were drawn converging towards the lower end of this line.

I trust that these comments may be of some value to the investigators if they intend to carry out further work on the subject of fluidity of molten cast iron, and it is encouraging that, in spite of all the work done on fluidity tests, the authors should have considered, as did the British Cast Iron Research Association, that the subject as far as cast irons are concerned was not exhausted.

E. R. EVANS
British Cast Iron Research Assoc.
Alvechurch, Birmingham

Explains fluidity research

■ The comments by E. R. Evans are appreciated since the results of his studies of fluidity generally corroborate those we obtained independently and by an entirely different approach.

Mr. Evans determined the effects of the various elements by varying each independently while holding the others constant. This of necessity required a large number of heats. He mentions a total of 94. The result is to establish nicely the effect of each of the elements for one or two base compositions, but no interrelation between variables can be established in this manner.

Mr. Evans chides us for using only 16 heats to reach our conclusion. Actually we used about 30 heats to establish the effect of carbon and 32 heats poured in 16 compositions to check carbon results and to establish the other variables. He apparently has failed to recognize the significance of the factorial experiment we employed with the 16 selected compositions. This type of experimental design makes it possible to use the data for all of the 32 heats repeatedly but in a different way each time to establish by calculation the effect of each element between limits selected.

In like manner we have been able to use the data from all of the heats to establish each of the interrelations, a feature not made possible from the experiments conducted by Mr. Evans. Viewed in this manner, our conclusions are not only validly made but have been arrived at with a minimum expenditure of time and effort and have provided information not readily attainable otherwise. A deviation of one inch in fluidity in duplicate tests, which Mr. Evans criticizes, has little significance since each composition factor is calculated on the basis of evidence supplied by all of the heats.

The advantage of the factorial experiment used by us is that it provides information on the direct and interrelated effects of the elements with a minimum number of heats. The disadvantage is not its inaccuracies as Mr. Evans would imply, but in the fact that linear variations in fluidity is assumed between the selected limits. Our preliminary work and Mr. Evans' results fully justify this assumption.

Our failure to refer to Mr. Evans' paper is not intentional, but merely results from the fact that the results reported were obtained before his paper was published. In fact, additional work done by us and presented at the International Foundry Congress in Atlantic City also preceded the publication of Mr. Evans' paper. In this additional work we have shown that fluidity falls off rapidly as the pouring temperature approaches the liquidus. We think this will answer the point Mr. Evans justifiably raises regarding our Fig. 8 near the liquidus temperature.

PHILIP C. ROSENTHAL, *Professor*
Mining and Metallurgy
University of Wisconsin

▶ *Index to American Foundryman for 1951 still available*

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coming events

June

16-17 . . Malleable Founder's Society
Homestead Hotel, Hot Springs, Va. Annual Meeting.

21 . . Northwestern Pennsylvania
Picnicana, Erie, Penn. Annual Picnic.

21 . . Quad City
Rock River, Moline, Ill. Annual Picnic.

23-27 . . Am. Soc. for Testing Materials
New York. Annual Meeting.

28 . . Western New York
Sturms Grove, Genesee St. Near Transit Road, Annual Chapter Stag Outing.

28 . . Central Ohio
Columbus Riding Club, Columbus, Ohio. Picnic and Annual Outing.

July

25 . . Philadelphia
Manufacturer's Golf and Country Club. Annual picnic and golf outing.

August

11-13 . . Sand School
Engineering Society, Detroit. To be conducted by the Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich. Write for reservations.

September

6 . . Central Indiana
Lake Shore Country Club, Indianapolis, Ind. Picnic and Golf Outing.

8-10 . . American Standards Association
Museum of Science & Industry, Chicago. National Standardization Conference.

8-12 . . Instrument Society of America
Annual Meeting, Cleveland.

8-13 . . Molding Materials Program
Sponsored by the Massachusetts Institute of Technology, Cambridge, Mass. *"Chemistry and Mechanics of Molding Materials."*

13 . . Michiana
Plymouth Country Club, Plymouth, Indiana. Annual picnic.

18-19 . . National Foundry Association
Edgewater Beach Hotel, Chicago. Annual Meeting.

22-23 . . Steel Founders' Society
Homestead, Hot Springs, Va. Fall Meeting.

26-27 . . Ohio Regional Foundry Conference
Ohio State University, Columbus, Ohio. Sponsored by A.F.S. Canton District, Central Ohio, Cincinnati District, Northeastern Ohio and Toledo Chapters and Ohio State Student Chapter.

30-October 3 . . Iron & Steel Exposition
Public Auditorium, Cleveland. Association of Iron and Steel Engineers.

coming events

October

16-17 . . Gray Iron Founders' Society
Hotel Cleveland, Cleveland. Annual Meeting.

16-18 . . Foundry Equipment Manufacturers' Association
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

17-18 . . Michigan Regional Foundry Conference
University of Michigan, Ann Arbor, Sponsored by A.F.S. Central Michigan, Western Michigan, Detroit and Saginaw Valley Chapters and A.F.S. Michigan State and University of Michigan Student Chapters.

20-24 . . American Society for Metals
Philadelphia National Metal Congress and Exposition.

24-25 . . Northwest Regional Fdy. Conf.
Multnomah Hotel, Portland, Oregon Sponsored by the Oregon, Washington and British Columbia Chapters and the Oregon State College Student Chapter of A.F.S.

November

6-7 . . All Canadian Fdy. Conference
Mount Royal Hotel, Montreal, Quebec. Sponsored by A.F.S. Eastern Canada and Ontario Chapters.

10-12 . . National Foundry Association
Edgewater Beach Hotel, Chicago. Annual Meeting.

13-14 . . Southwest Regional Fdy. Conf.
Hotel Baker, Dallas, Texas. Sponsored by A.F.S. Texas and Tri-State Chapters and Texas A & M Student Chapters.

19 . . American Standards Association
Waldorf-Astoria Hotel, New York. Annual Meeting.

December

4-6 . . American Institute of Metallurgical & Mechanical Engineers
William Penn Hotel, Pittsburgh, Pa. Electric Furnace Steel Conference.

February, 1953

19-20 . . Southeastern Regional Conference
Tutwiler Hotel, Birmingham, Ala. Sponsored by Birmingham District & Tennessee Chapters and University of Alabama Student Chapter.

June, 1953

29-July 3 . . American Society for Testing Materials
Chalfonte-Haddon Hall, Atlantic City, N. J. Annual Meeting.

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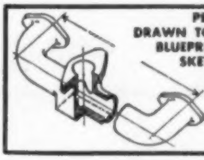

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